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THE

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OF

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OF

PATENT INVENTIONS.

CONDUCTED

BY W. NEWTON,

CIVIL ENGINEER AND MECHANICAL DRAFTSMAN.

(Assisted by several Scientific Gentlemen.)

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LIST OF PLATES IN VOL. XIII.

[CONJOINED SERIES.]

I. Berry's Stave-cutting Machine.
II. Tenneson's Gas Apparatus, and Napier's Printing Press.
III. Foucard's Gun Lock; Harrold's Paper-making Apparatus; De Bode's Capstan; Perkins's Blowing Apparatus; Axon's Spinning Machinery; and White's Machine for Raising Water.
IV. Fourness's Ventilating Apparatus.
V. Peppercorne's Improved Carriage; Holebrook's Paddle Wheel; and Fitton and Collier's Improved Loom.
VI. Buckingham's Apparatus for Raising Water; Lowe's Improvements in Propelling; and Sheppard's Improved Tiles.
VII. Dutton's Improvements in Weaving and Dressing Woollen Cloth; and Parkes's Flat Pit Chain.
VIII. Joyce's Heating Apparatus; Bates's Wool-dressing Machinery; Ivison's Smoke Consumer; and Pleney's Brick Machine.
IX. Montauban and Medeiros's Improved Gas Apparatus; Wells's Hat-making Machinery; and Stephens and Nash's Apparatus for making Prussiates.
X. White's Improvements in Lathes; Lewis and Ferrabee's Improvements in Dressing Woollen Cloth; and Pearce's Improved Wheel.
XI. Nicholson's Spinning Machinery.
XII. White's Lace Machinery; Dale's Bed-posts; and Heginbotham's Gas Retort.
XIII. Berry's Apparatus for Economising Heat; Westhead's Apparatus for Cutting India Rubber; and Loach's Rack Pulley.
XIV. Roberts's Improvements in Looms; and Taylor's Propelling Machinery.
XV. Southam's Improvements in Drying Grain; Wells and Eccles's Improved Loom; and Berry's Motive Power.

INDEX TO VOL. XIII.

[CONJOINED SERIES.]

Page

Adjudication, Scientific, Bodmer's extension 175
————————, Roberts's extension 370
————————, Wright's extension 371
Bedsteads, improvements in, Selby's patent 392
Blowing and exhausting air, improvements in, Perkins' patent 39
Breakwaters, improvements in the construction of, Taylor's patent 292
Buttons, improvements in the manufacture of, Elliott's patent 81

Calico-printing, improvements in, Woone's patent 162
Caoutchouc, communication by Dr. Ure on 364, 398
Capstans, improvements in, De Bode's patent 33
Carpets, improvements in the manufacture of, Whytock's patent 386
Celestial Phenomena, 56, 120, 184, 248, 312, 384
Chains for pits and mines, improvements in, Parkes' patent 138
China, improvements in ornamenting, Embrey's patent 22
Civil Engineers, report of the transactions of the Society of, 46, 105, 169, 234, 303, 372 408
Cleaning wool, improvements in, Bates's patent 152
Columns, pillars, and bedposts, improvements in the construction of, Dale's patent 277
Consuming smoke, improvements in, Ivison's patent 141
Corks, improved machinery for making, Thompson's patent 167
Cutting turnips and other roots, improvements in, Gardner's patent 268
——— India rubber, improvements in, Westhead's patent 28
——— and sawing wood, improvements in, Gibbs and Applegath's patent 397

Page

Dressing cloth, improvements in, Dutton's patent 121
————————, Lewis and Ferrabee's patent 189
Drying corn, improvements in, Southam's patent 359

Economizing fuel, improvements in, Berry's patent 285
Enemata, improvements in injecting, Maw's patent 41

Fire engines, improvements in the construction of, Castle and North's patent 23
Flat rope, improvements in making, Crawhall's patent 389
Flax, improvements in spinning, Shankland's patent 25
——, preparing plants as substitutes for, Berry's patent 231
Fuel, improvements in the manufacture of, Oram's patent 134
——, from peat moss, Williams's patent 333

Gas, improvements in apparatus for making, Montauban and Medeiros's patent 185
——, improvements in retorts for making, Heginbotham's patent 273
——, improvements in regulating the supply of, Tenneson's patent 18
Glass, improvements in the manufacture of, Clay and Smith's patent 73

Hats, improvements in machinery for making, Wells's patent 191
Harbours of refuse on a new principle 41
Heating apparatus, an improved, Joyce's patent 146
Hemp, improvements in preparing, Goschen's patent 227

Injecting enemata, improvements in, Maw's patent 41
Iron, improvements in the manufacture of, Barnett's patent 272

Lace, improvements in the manufacture of, Alcock's patent 390

Page
Lace, improvements in the manufacture of, Alcock's patent · 391
———, White's patent · · · · · · · · · · 249
Lathes, improvements in the construction of, White's patent · 215
Letter-press printing, improvements in, Napier's patent · · 15
Locks and latches, improvements in, Parsons' patent · · · · 393
Locomotion, improvements in, Peppercorne's patent · · · · 82
Looms for weaving, improvements in, Dutton's patent · · 121
———, improvements in, Fitton and Collier's patent · · · · · · · · · 90
———, improvements in, Roberts's patent · 313
———, improvements in, Wells and Eccles's patent · · · · · · · · · 355
Mechanical agent, for a new, Berry's patent · · · · · · 351
———, Buckingham's patent · · · · · · 97
Paper, improvements in making, Harrold's patent · · · · · 32
———, Stevenson's patent · · · · · · · 103
Patents, list of, Sealed in England, 52, 117, 178, 242, 307, 381
——— Scotland, 50, 115, 176, 240, 306, 379
——— France, 376, 418

REPORT OF RECENT PATENTS.

Alcock, T., for improvements in making lace · · · · · · · 390
———, for improvements in making lace · · · · · · · 391
Applegath, A., and Gibbs, T., for improvements in cutting and sawing wood · · · · · 397
Axon, C., for improvements in spinning · · · · · · · · · 40
Barnett, W., for improvements in making iron · · · · · · 272
Bates, J., for improvements in cleaning wool · · · · · · · 152
Berry, M., for improvements in cutting staves for barrels · · 1
———, for preparing plants as substitutes for flax · · · · · 231
Berry, M., for improvements in economizing fuel · · · · · 285
———, for a new mechanical power · · · · · · · · · 351
Buckingham, J., for improvements in raising water · · · 97
Burlingham, T., for improvements in windmills · · · · 396
Castle, R., and North, W. G., for improvements in fire engines 23
Clay, W. N., and Smith, J. D., for improvements in making glass · · · · · · · · · · 73
Collier, G., and Fitton, C., for improvements in power-looms 90
Consitt, J., for improvements in spinning cotton · · · · · · 362
Cooper, E., for improvements in making soap · · · · · · · 226
Cox, W. H., for improvements in tanning hides and skins · 26
Crawhall, J., for improvements in making flat rope · · · · 389
Dale, W., for improvements in the construction of columns, pillars, and bedposts · · · 277
De Bode, Baron, H., for improvements in capstans · · · 83
Durant, J. W., for an improved music holder · · · · · · · 395
Dutton, J., for improvements in weaving and dressing woollen cloth · · · · · · · · · · 121
Eccles, S., and Wells, W., for improvements in power-looms 355
Elliott, W., for improvements in the manufacture of buttons · 81
Embrey, G., for improvements in ornamenting china · · · 22
Ferrabee, J., and Lewis, W., for improvements in dressing cloth 189
Fitton, C., and Collier, G., for improvements in power-looms 90
Foucard, L., for improvements in percussion locks · · · · 31
Fourness, W., for improvements in ventilating pits, &c. · · · 57
Gardner, J., for improvements in cutting turnips, &c. · · · · 268
Gibbs, T., and Applegath, A., for improvements in cutting and sawing wood · · · · · 397
Goschen, H., for improvements in preparing hemp · · · · · 227
Harrold, W., for improvements in making paper · · · · · 32

Page

Heginbotham, W. H., for improvements in gas retorts • • 273
Holebrook, J. P., for improvements in propelling • • • • 61
Howard, T., for an improved vapour engine • • • • • • • • 385

Ivison, M. W., for improvements in consuming smoke • • • • 141

James, W. H., for improvements in steam carriages • • • • • • 394
Joyce, T., for an improved heating apparatus • • • • • • • 146

Leman, J., for improvements in the manufacture of soap • • 42
Lewis, W., and Ferrabee, J., for improvements in dressing cloth 189
Loach, J., for improvements in rack pulleys for blinds • • • 269
Lowe, J., for improvements in propelling • • • • • • • • • 93

Maw, J. H., for improvements in injecting enemata • • • • 41
Montanban, H. F. M. de Bouffet and Medeiros, J. C., for improvements in the manufacture of gas • • • • • • • • 185

Napier, D., for improvements in letter-press printing • • • 15
Nash, E., and Stephens, H., for improvements in the manufacture of prussiates • • • • • 207
Nicholson, W., for improvements in spinning • • • • • • • 220
North, W. G., and Cattle, R., for improvements in fire engines • • • • • • • • • • 23

Oram, T., for improvements in the manufacture of fuel • • 134

Parkes, H. P., for improvements in making flat pit chains • • 138
Parsons, for improvements in locks and latches • • • • • 393
Pearce, J., for improvements in the construction of wheels • 233
Peppercorne, G. R., for improvements in locomotion • • • • 82
Perkins, J., for improvements in blowing and exhausting air • 39
Pleney, J. B., for improvements in making bricks • • • • • 158
Roberts, J. L., for improvements in the construction of looms • 313
Roberts, R., for improvements in steam engines • • • • • • 77
Seignette, L. E., for improvements in preserving animal and vegetable substances from decay • • • • • • • • • • 101
Selby, R., for improvements in the construction of bedsteads 392
Shankland, A. B., for improvements in spinning flax • • • 25
————, for improvements in spinning wool • • • • • • 388
Sheppard, R., for improved tiles for roofs • • • • • • • • • • 100
Smith, J. D., and Clay, W. N., for improvements in making glass • • • • • • • • • • • 73
Southam, W., for improvements in drying corn • • • • • • • • 359
Stephens, H., and Nash, E., for improvements in the manufacture of prussiates for dyeing, staining, and writing • • • 207
Stevenson, D., for improvements in writing paper • • • • • • 103
Stolte, E., for improvements in making sugar • • • • • • • 271
Taylor, J. J. O., for improvements in propelling • • • • 346
———, J. N., for an improved breakwater • • • • • • • • • 292

Tebbutt, T. R., and Watt, C., for improvements in making white lead • • • • • • • • • 263
————, for improvements in making soda • • • 339
Tenneson, H. Q., for an improved apparatus for regulating the supply of gas to burners • • • • • • • • • 18
Thomson, K. N., for improvements in making corks • • • 167

Watt, C., and Tebbutt, T. R., for improvements in making white lead • • • • • • • • • 263
————, for improvements in making soda • • • • • • 339
Wells, H. A., for improvements in making hats • • • • • • 191
———, W., and Eccles, S., for improvements in looms for weaving • • • • • • • • • 355
Westhead, J. P., for improvements in cutting India rubber 231
White, J., for improvements in raising water • • • • • • • 35
———, for improvements in lathes • • • • • • • • • • • 215
———, R., for improvements in making ornamental lace • • 249

Page

Whytock, R., for improvements in the manufacture of carpets 386

Williams, C. W., for improvements in preparing peat for fuel 333

Woone, G., for improvements in calico-printing 162

Peat coke, communication on 293

Peat moss for fuel, improvements in preparing, Williams's patent 333

Percussion-locks, improvements in the construction of, Foucard's patent 31

Preserving substances from decay, Seignette's patent 101

Propelling, improvements in, Holebrook's patent 61

———, Lowe's patent 95

———, Taylor's patent 346

Prussiates, improvements in the manufacture of, Stephens and Nash's patent 207

Rack pulleys for window blinds, improvements in, Loach's patent 269

Raising water, improvements in, Buckingham's patent 97

———, White's patent 35

Retorts for gas, improvements in, Heginbotham's patent 273

Sawing and cutting wood, improvements in, Gibbs and Applegath's patent 397

Soap, improvements in the manufacture of, Cooper's patent 226

———, Leman's patent 24

Page

Soda, improvements in making, Watt and Tebbutt's patent 339

Spinning machinery, improvements in, Consitt's patent 362

———, Nicholson's patent 220

———, Shankland's patent 25

———, Shankland's patent 388

Staves for barrels, improvements in cutting and preparing, Berry's patent 1

Steam carriages, improvements in, James's patent 394

———, Roberts's patent 77

Sugar, improvements in the manufacture of, Stolte's patent 271

Tanning hides and skins, improvements in, Cox's patent 26

Tiles for covering roofs, improvements in making, Sheppard's patent 100

Turnips, improvements in cutting, Gardner's patent 268

Vapour engines, improvements in, Howard's patent 386

Ventilating pits and mines, Fourness's patent 57

Wheels, improvements in the construction of, Pearce's patent 233

White lead, improvements in the manufacture of, Watt and Tebbutt's patent 263

Windmills, improvements in the construction of, Burlingham's patent 396

Woollen cloth, improvements in dressing, Dutton's patent 121

———, Lewis and Ferrabee's patent 189

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CONJOINED SERIES.

No. LXXIX.

Recent Patents.

To Miles Berry, *of* 66, *Chancery-lane, in the county of Middlesex, patent agent and mechanical draftsman, for certain improvements in machinery or apparatus for forming staves for barrels, casks, and other purposes.*—[Sealed 13th July, 1836.]

These improvements in machinery or apparatus for forming staves for barrels, casks, and other purposes, are designed for cutting out and shaping such staves from a solid piece or block of timber, in a more expeditious and perfect manner than has heretofore been effected by machinery. They apply to the several operations, firstly, of cutting off or severing in curved shapes the requisite thicknesses from the block to form the staves; secondly, in bevelling and properly shaping the edges of such portions, or staves, in order that they may fit accurately together at the junctions, when combined to form a cask;

and, thirdly, in dressing or finishing, and shaping the outer surfaces of such staves, to suit the proper rounded form of the barrel when completed.

The improvements are embodied in what may be considered three distinct machines, although the requisite parts for performing two or more of the operations may be united in one framing, if considered desirable, as will be shown in the accompanying drawings.

The piece of wood to be operated upon, is first rendered or prepared by sawing or otherwise, and brought to a proper parallel and equal thickness to suit the proposed width of the stave; the breadth of the block being in accordance with the proposed length of the stave; and it is to be understood that the fibres of the wood are to be kept as nearly as possible in the longitudinal direction of the stave.

In Plate I., fig. 1, is a plan or horizontal view of one of these improved machines, for cutting off or severing the requisite portions to form the staves; the platform or carriage which contains the timber being just about to start, and bring the block under the operation of the saw to cut off a stave; fig. 2, is a front elevation, with the block of timber shown in its proper situation; and fig. 3, is a similar view to fig. 2, the sliding carriage on which the block of timber is placed being removed to expose the parts below; fig. 4, is a plan view of the timber carriage or platform detached from the machine; the parts being shown in a different position to fig. 1, that is, with the sliding lever clamps opened, and drawn back ready to take a fresh hold of the block, as will be hereafter explained; the cross beam of the carriage being removed to expose the parts beneath: *a*, *a*, *a*, is the framework and standards of the machine, which may be constructed of wood or metal in any convenient manner; *b*, *b*, is the carriage and platform upon which the block of timber is placed; *c*, *c*, are the curved guides or beds upon which the carriage travels (in the direction of the arrows), as the portions intended to form the staves are severed from the block by the circular saw *d*, which is made concave on its side next the block, and convex on the other, so as to suit the curve or bilge of the stave; but it should be parallel in thickness, or nearly so. The saw is mounted on the end of the shaft or axle *e*, turning in proper bearings in the framework, and is put in rapid rotary motion by a band passed from a steam engine, or other first mover, to the rigger *f*. The carriage is actuated by an endless band *g*, passed round a small pulley on the axle *e*, and over guide pulleys to the rigger *h*, mounted on the end of the shaft *i*, which turns in a proper bearing in the framework at its outer end, and at the opposite extremity in a bearing mounted on the rocking lever *k*; the fulcrum of this rocking lever being in the centre pins of the cross bar *l*, to which it is attached.

This shaft *i*, carries an endless screw or worm *m*, which takes into a toothed rack *n*, mounted on the under side of the carriage, and thereby causes it to travel progressively in the direction of the arrows, until a stave has been severed from the block. When this has been done, the endless screw is thrown out of gear with the rack, and the carriage is allowed immediately to run back to its first position (as shown in fig. 2), which it is caused to do by a weight suspended from a cord *o*, passed over a pulley, and attached to the carriage. The endless screw is kept in gear with the rack *n*, by a projecting shed or piece *p*, on the sliding bar *q*, the shed being held down by a projecting spring catch *r*, on the framework. The sliding bar *q*, is attached to the rocking lever *k*, by screws and slots, so as to allow it to slide freely in the direction of its length.

The block of timber is placed upon the carriage, resting upon the cross rails *s*, *s*, its inner edge projecting over from the carriage a sufficient distance, so that the saw *d*, may, in the first instance, cut off a sufficient quantity, without wasting more of the timber than necessary, to give the proper curved or bilged form to the outer surface of the stave next to be severed from the block; care being taken, in the first instance, to place the timber in its proper position upon the platform: *t*, is a guide pin or stop, against which one edge of the timber is placed, to assist in adjusting its position. The block is held on the carriage by the weighted lever clamp *u*, which is raised to admit of the timber being placed upon the cross rails.

This lever clamp is mounted, so as to turn freely on a joint in an adjustable bearing on the cross beam *v*, of the carriage. It has at its fulcrum end a cam or curved arm, which acts upon a spring piece *w*, furnished with claws or teeth, which are pressed into the block when forced down by the lever clamp, and thereby holds it firmly.

The machine being put into operation, it continues to cut off the required portions for the staves, and feed in or shift the timber forward, each time the carriage and platform returns after a stave has been cut off. This is effected in the following manner:—On the piece of timber being placed upon the carriage in the position shown by the dotted lines *a*, *a*, in fig. 1, and secured by the lever clamp, the endless screw *m*, is thrown into gear with the rack *n*, by first pushing and then depressing the handle of the sliding bar *q*, which will move the stud *p*, from the upper side of the spring catch *r*; a spring attached to the bar returning it, and bringing the stud under the catch: this movement will raise the other end of the rocking lever, and keep the worm and rack in gear. On this being done, the carriage with the timber will immediately begin to travel along the guide beds *c*, *c*, and bring the timber under the operation of the saw *d;* the carriage continuing to travel in the direction of the arrow until the stave is severed from the timber. At this time the stop piece *x*, on the under side of the carriage, comes in contact with another stop piece *y*, on the sliding bar *q*, whereby the stud *p*, on the sliding bar will be withdrawn and disengaged from the catch *r*, when a spring *z*, placed on the under side of the carriage, will immediately depress this end of the rocking lever *k*, and throw the endless screw *m*, out of gear with the rack *n*; and the carriage will be free to be run back into the position shown in fig. 1, which it will be caused to do by the weight of the cord *o*.

The stud of the lever clamp *u*, as the carriage runs back, passes up the inclined plane *x*,* whereby its longer end is raised, and the timber released from the pressure: the inclined plane 15, being connected by a joint to its standard 16, so as to allow of the stud passing under it as the carriage travels the reverse way.

The timber must now be moved inward, the proper distance for another stave, by the feeding apparatus, which I shall describe: 1, 1, are sliding lever clamps, placed one on each side of the carriage, and held in their proper situations by screws and slots; they are furnished with claws or clamps formed on their inner ends, and have a parallel and longitudinal sliding motion given to them, as well as an opening and closing movement to the claws or clamps, by the following means: the sliding lever clamps are connected by joints to the bars 2, 2, which are also jointed at their other extremities, to the inner end of the centre lever 3; and as the outer end of this lever is moved from side to side, governed by its pin 25, sliding in the parallel slot 26, during the travelling of the carriage, the claws or clamps of the sliding levers 1, 1, are brought nearer to or further from each other, and are thereby made to take fast hold of the block, in order to carry it forward a proper distance, and then release it, for the purpose of taking fresh hold, and so on. The carrying in of the plank or feeding, is effected by the T-shaped lever 4, having its fulcrum on the pin 5. The end of one of the arms of this lever is connected by a pin and slot joint to the right hand lever clamp, the other end being connected by a knuckle joint to another lever 6, having its fulcrum at 7, and its reverse end connected by a pin and slot joint to the left hand lever clamp. The third or outer arm of the lever is acted upon by a stop piece, fixed on to the framework, and is thereby caused (as the carriage returns) to act upon the clamp levers, and make them carry forward the block. These two movements of the lever clamps are effected in the following manner:—

Suppose the carriage to have proceeded in the direction of the arrow, and the saw has nearly cut off a stave, the end of the centre lever 3, will have come in contact with the upper end of the weighted stop lever 8, which is forced towards the left hand by the weight and cord 9; and as the carriage continues to move towards the right hand, the stop lever 8, will arrest the progress of the end of the centre lever 3, as the carriage travels past, and cause it to draw the clamps together at its inner end by means of the connexions, and thereby cause them to close upon the block; and when they have taken a sufficiently firm hold, the stop lever 8, will give way. The end of the centre lever is retained in this position by a pall or tooth on its under side, taking into the teeth of a rack 10, formed on the upper side of the lever 11; which lever has its fulcrum at one end in the pin 12, the other end being held up toward the centre lever by a spring 13. On the carriage nearly finishing its motion towards the right hand, that is, as soon as the stave is cut off, the adjustable stop *x*, on the under side of the carriage, comes into contact with the catch piece *y*, on the bar *q*; and by sliding that bar longitudinally, draws the catch *p*, from under the spring catch *r*, when the spring *z*, on the underside of the carriage, will depress this end of the rocking lever *k*, and draw the endless worm out of gear with the rack *n*. The carriage will now be made to run quickly back by the weight on the cord *o*, and the stud of the lever clamp *d*, will now come in contact with the inclined plane 15, by which it will be raised, and the timber freed from the pressure. At this time, the outer arm of the T-lever comes in contact with the fixed stop piece 17, of the framework, and the arm of this lever is thereby arrested, which causes its other arms, by their connexion with the sliding lever clamps, to force them forward, and carry with them the timber, the proper distance for the thickness of a stave. When this is done, the stud of the lever clamp *u*, has passed away from the upper side of the inclined plane 15, and the weighted end of the lever clamp *u*, has fallen down, and has again firmly secured the block. At this time, the projecting stop piece *x*, on the underside of the carriage, comes into contact with the spring catch *r*, of the framework, and forcing it back, releases the projecting stud *p*, of the sliding bar *q*, by which means the lever is freed, and the spring *z*, of the carriage immediately forces this end of the rocking lever down, and raises the other end, which brings the endless screw into gear with the rack, when the carriage again begins to move in the direction of the arrows. The stud of the lever clamp *u*, passing under the inclined plane 15, which is jointed to its standard 16, thereby allowing it to be raised, so as to permit the stud to pass, when it falls into its former position, to receive the stud on its upper side on the return of the carriage. And as the carriage progresses, the stud 18, of the lever 11, comes in contact with the under side of the inclined plane of the trip lever 19, which is mounted on a pin joint on the side of the framework. By these means, the stud 18, and lever 11, will be depressed, which will withdraw the teeth of the rack 10, from the pall or catch of the centre lever 3, and leaves it free to be moved back again; and the clamps opened by the spring 20, connected at one end to the centre lever, and at the other to the frame of the carriage. The lever clamps are thereby opened for the purpose of releasing the timber, when they are drawn back ready to take hold of another part of the timber, by the springs 21, 21, at their sides connected by pins to the levers, and to the frame of the carriage; the distance they are brought back being according to the thickness of the stave, which is determined by the adjusting screw 22, on the right hand sliding lever clamp, and the stop piece 23, on the frame of the carriage. The progress of the carriage continuing, the end of the centre lever again comes in contact with the weighted stop lever 8, when the lever clamps are made to take a fresh hold on the timber; and the other parts will go through the same motion as before described, continually cutting off a fresh portion, to form a stave, until the timber is used up, when the carriage must be stopped, and a fresh piece of timber introduced.

In concluding the description of this machine, I would remark, that the cross beam of the carriage is made adjustable by screws and nuts upon the vertical standard supporting it, in order that the lever clamp may be made to press with proper force upon pieces of timber of different thickness, and that the curve of the guide beds of the carriage should be the segment of a circle, or nearly so, and adapted to suit the intended bilge of the stave or cask.

Also, I would remark, that there may be a revolving fan or blower 22, and proper guides or partitions placed in connexion with the machine under the saw, in order to blow off the sawdust in one direction.

The next operation I shall describe, will be that of bevelling and properly shaping the edges of the now cut staves, that is, giving them the required "head rake;" a narrowing form from the centres toward the ends, which is also effected by a circular saw: the mechanism for performing which is exhibited in the several figures in sheet 2, of the accompanying drawings, and is mounted in conjunction with the machinery for rounding and shaping the outer surface of the staves in one framework.

Fig. 1*, is a plan or horizontal view of this double machine; the mechanism for bevelling and shaping the edges being situated on one side of the framework, and that for rounding the outer surface on the other side. Fig. 2*, is a side elevation of the machine, taken on that side next the rounding machinery; and fig. 3*, is a transverse section, taken through both machines, in the direction of the dotted line a, b, in fig. 1: *a, a,* is the framework and standards of the machinery; *b,* the platform, or carriage, upon which a number of unfinished staves are placed, the carriage travelling along the curved bed or rail *c.* The staves are placed on the carriage, with their outer or bilging side downwards, and are held firmly therein by a lever clamp *d,* mounted in the adjustable cross beam *e,* of the carriage. The lever acts upon the spring piece *f,* as in the former instance; but the teeth, or claws, are dispensed with. The staves are sustained in the carriage by their ends resting on projecting ribs, being pressed downwards in the middle, the crosses are cut to nearly the required bevel and head rake, the staves being bent into the form (or nearly so) they will be when hooped together: *g,* is the circular saw, which in this instance is of the ordinary construction, and is mounted on the main driving shaft *h,* which turns rapidly in proper bearings in the framework, and is set at a slight angle with the horizon, to give, in conjunction with the adjustable position of the carriage hereafter described, the proper bevel to the edge of the stave. Motion is communicated to the main shaft *h*, by a band passed from any first mover to the rigger *i*, which gives motion to the saw *g*, and through an endless band *k*, passing over guide pulleys to the rigger *l*, on the end of the shaft *m*, carrying an endless worm or screw *n*, as in the former machine. The shaft *m*, is mounted at its outer end in a proper bearing in the framing, its other extremity turning in a bearing on the end of the lever *o*, having its fulcrum in the side frame; which lever acts in conjunction with a spring catch *p*, by which the endless screw is thrown into or out of gear, with a rack *q*, placed on the underside of the carriage, as before; *r*, is a spring adapted to the shaft, tending to keep it pressed down with the endless worm when thrown out of gear, the spring catch *p*, keeping it in gear when the carriage is in operation. The carriage is placed on the framework, with its inner edge resting on the curved guide bed, or rail *c*; and its other or outer edge is supported by the adjustable tail piece *s*, which works in a groove *t*, in the framework. By inspecting fig. 3*, it will be seen that by means of this adjustable tail piece *s*, the platform, or carriage, with the staves, can be set at any required angle to the horizon, that is, with the inner edges of the staves inclining over towards the circular saw; and by these means, and also the inclined position of the axis of the saw, the edges of the staves are cut to any required bevel. At the same time, from the curved or bilged form of the staves and their position in the carriage, the proper head rake or narrowing towards the ends is given to them, thereby producing staves nearly of the proper shape for putting together and forming a cask, for they will thereby be prepared nearly ready for the cooper, and will require but little adjusting or finishing by hand.

The operation of this mechanism is as follows:—the carriage being situated at one end of the machine, as shown in fig. 1*, and the worm and rack out of gear, a proper number of unfinished staves are placed on the carriage with their bilged or outer sides downwards, their edges being pressed in contact with the guide stops *u, u,* fixed on the framework; the handle of the lever clamp *d,* is then moved over to the other side and depressed, when the staves will be held firmly in the carriage. The attendant then throws the worm and rack into gear, by depressing the outer end of the lever *o*: this will raise the end of the shaft *m,* and bring the worm into gear with the rack, in which position it will be held by the spring catch *p.* The carriage will now immediately begin to move in the direction of the arrow, bringing the staves under the operation of the saw, when the superfluous parts will be cut off; and as soon as this is effected, the projecting stud or stop piece *v,* on the side of the carriage, comes into contact with the upper end of the spring catch *p,* which will thereby withdraw the catch from the end of the lever *o,* and consequently release it. The spring *r,* of the shaft *m,* will then depress the worm, and draw it out of gear with the rack; and the progress of the carriage will be stopped, when it may be returned to its former position by hand or a weight, as in the first machine. The end of the lever clamp *d,* is then to be raised and turned over, when the staves will be released: they are then to be removed and reversed in the carriage, and their other edges brought to under the operation of the saw, as above described.

I shall now proceed to explain the mechanism for shaping or rounding off the outer surface of the staves, to suit the rounded form of the casks or barrels. A number of the staves are brought to this machine, and placed upon a platform between guides with their outer or bilged surfaces upwards, and are severally carried by means of an endless chain furnished with claws under the operation of a series of rapidly revolving cutters or adzes, which remove the superfluous portions of the edges of the staves, and shape them to suit the outer or rounded form of the barrel; the platform with the staves being brought up to the action of the revolving cutters by weighted levers.

A, A, is the platform, upon one end of which the staves B, B, are placed between the upright guides C, C, C, as shown in figs. 2*, and 3*, the other end of the platform being used for the delivering thereof. This platform is attached to strong legs D, moving vertically between proper guides on the ends of the frame, or by screws and slots connexions. The platform with the staves is supported upon the shorter ends of two weighted levers E, E, having their fulcrums in the framework, and carrying heavy weights F, F, at their other extremities; G, G, G, are the revolving adzes or cutters, secured to discs H, H, mounted on the shaft I; which shaft turns in proper plummer boxes or bearings in the metal framing K, K, fixed on to the framework of the machine. The cutters and shaft are put in rapid motion by a band or strap passed from the pulley or rigger L, (on the main drawing shaft Z,) to another rigger N, on the end of the shaft I: N, N, is the endless chain, moving in a guide groove on the upper side of the platform; its claws or hooks projecting up through the groove, so as to take hold of the staves, as shown in figs. 1*, and 3*. The chain is passed over proper guide pulleys in the platform at one end of the machine, and over the toothed carrying or spur pulley O, at the other end of the machine. The chain carries two or more hooks or claws P, which take hold of the staves, and bring them under the operation of the rotatory cutters; the chain being put in motion in the following manner:—O, is an endless band passed from a small rigger or pulley on the end of the shaft I, and over the pulley R, mounted, but turning loosely on a centre pin or stud fixed in the framework, and carrying another smaller pulley S, on its boss; from whence another endless band passes to the other pulley T, also turning loosely on a projecting centre stud or pin, and carrying a small toothed wheel U, which takes into the larger toothed wheel V, on the end of the axle of the spur pinion O, of the endless chain.

The staves being placed in the machine, as shown in fig. 2*, the hooks or claws of the endless chain come in contact with the ends of the undermost stave of the pile, and carry it forward. It is then brought under the operation of the cutters which takes off the superfluous parts of the outer surface of the staves; and when that is done, they are delivered in a nearly finished state from the opposite end of the platform: W, W, are spring guides, which serve to assist in conducting the staves properly under the operation of the cutters; and X, X, are retarding springs, which receive the stave, and prevent it being dragged out of the machine by the cutters; this may also be accomplished by weighted friction rollers pressing upon the staves, if thought desirable: Y, Y, are studs or pins placed on the legs D, of the platform, which prevent the staves being carried up too near the rotatory cutters.

Having now described the construction and operation of these several machines, I wish it to be understood that I do not intend to confine myself to the precise form or dimensions of the parts herein shown, as they must be varied to suit staves of different sizes, and adapted for different shaped barrels, pipes, or hogsheads, and also, in some measure, to the nature of the wood to be operated upon. And I do not mean to claim any of the working parts separate, as some of them may have been before used for such or similar purposes: but I claim as the essential features of these improvements, firstly, the arrangement or construction and adaptation of the machinery *first* above described, for cutting off curved or bulging portions from a piece of timber, to produce staves, by means of a circular concave-convex saw, adapted to a carriage, or platform, carrying the timber, and travelling upon curved beds or guide rails, and having a proper feeding apparatus, and mechanism for throwing the machine in and out of gear, and running the carriage forwards and backwards during such operation, however the driving may be effected, or the forms of the framework varied: secondly, the machinery *second* above described, for shaping the sides of the staves to the proper curve or head rake, and bevelling their edges by means of the platform, or carriage, travelling upon rails placed at an inclination to the horizon, and adapted to a circular saw; the axis of which may, if desired, be at an inclination to the horizon, for the purpose of cutting the edges of the staves at the required angle, or bevel; and, at the same time (from the bent or bulged form of the staves placed upon the carriage), the saw is made to give them the required shape, or "head rake," that is, rendering them narrower at the ends than in the middle: and, thirdly, in the mechanism or apparatus *third* above described, by which the outer surfaces of the staves are brought under the operation of rapidly revolving cutters, or edges, which take off the superfluous parts, bringing them to accord with the rounded shape of the barrel when completed.—[*Inrolled in the Rolls Chapel Office, January,* 1837.]

Specification drawn by Messrs. Newton and Berry.

To DAVID NAPIER *of the York-road, Lambeth, in the county of Surrey, engineer, for his invention of improvements in letter-press printing.*—[Sealed 18th April, 1837.]

THIS invention consists in improvements upon two different kinds of letter-press printing machines; viz. first, that kind which is known by the name of flat-surface printing machines; the type being laid upon one surface, and the impression given by another, by means of levers or otherwise; secondly, in that kind which is known by the name of cylindrical printing machines, having the type fixed upon one cylinder, and the impression given by another, which revolves along with and against it.

Both the above methods of printing have been long known, and in use; and seeing that I claim no particular arrangement or construction of these machines, either in whole or in part, save only those points which are the subject of this Patent, I have therefore drawn and described in this specification those parts only which are necessary to a full understanding of my invention. Plate II., figs. 8, 9, and 10, illustrate the first part of my invention (the same letters denoting the same parts in each); the object of which is to obtain from the continuous revolving shaft A, a horizontal reciprocating action to the frisket frame B, and, at the same time, an interval of rest at each end of its action, to allow time for the impression to be taken, and for laying on the paper, &c. This is obtained by the compound excentric piece C, which I shall hereafter denominate the guide C, of which fig. 9, is an elevation, and fig. 10, a section, the action of which is as follows.

The guide C, being fixed upon the shaft A, which revolves in the direction of the arrows with the sliding piece D, connected to the end of the lever E, as shown in section at fig. 10, and inserted into the circular groove of the guide C, as shown at different points in fig. 9, whilst the lever E, is connected with the frisket frame B, by levers, as shown at fig. 8. It is obvious, that as the guide C, revolves from its present position in fig. 8, that during the first half revolution it will produce no action upon the lever E, the sliding piece D, being then in the outer concentric groove F, and consequently the frisket frame B, will be at rest in its present position. But during the second half revolution, the action of the sliding piece D, in the excentric groove G, will bring the lever E, down to the dotted line H, and consequently the centre of the frisket frame B, from I, to K, as shown by the dotted lines, which denote the vibration of the levers. The third half revolution will produce no action on the lever E, the sliding piece D, being then in the inner concentric groove L, leaving the frisket frame B, at rest as before, but at the opposite end of its action; and during these intervals of rest, the frisket frame B, being double, an impression may be given by the surface (or platen), represented at M, in any of the ordinary ways, at one end, while a sheet is being laid on at the other. During the fourth half revolution of the guide C, the action of the sliding piece D, in the excentric groove N, will bring the lever up again to its original position; and, in like manner, the frisket frame B, to the point from whence it started, as seen at fig. 8.

Fig. 11, will serve to describe the second part of my invention, which is a greater facility in the process of printing. This I obtain simply by appropriating part of the periphery of the type cylinder as a distributing surface for the ink, and increasing the inner bar of the impressing cylinder, thus enabling me to obtain several impressions from one type cylinder: A, represents a type cylinder, which revolves in the direction of the arrows; from B, to C, represents stereotype plates; D, D, D, &c. &c., impression cylinders with their inking rollers H; the distributing surface may commence at E, and occupy more or less of the type cylinder A, according to the number of impression cylinders D, intended to be used.

The feeding roller F, which takes its ink in the common way from the duct roller G, communicates the same in two or three revolutions on the distributing surface at E, so that each set of inking rollers H, H, H, &c. &c., will pass over the whole length of distributing surface E, before they come into contact with the type, there being one set of inking rollers H, for each impressing cylinder D. The paper may be supplied and delivered in any of the usual ways; that represented by the rollers I, tapes K, and boards L, is adopted by some of the most rapid machines at present in use.

I may here again state, that I claim no particular arrangement or construction of these machines, either in the whole or in part, save only the points already described, and which are as follows; viz. first, in flat-surface printing machines, I do claim as my invention, that peculiar combination of excentric and concentric guides which I have called the guide C, whereby I obtain from the shaft A, a reciprocating action to the frisket frame B, and an interval of rest at each end of its action; secondly, in cylindrical printing machines, I do claim as my invention, the mode of appropriating a part of the periphery of the cylinder on which the type (of whatever kind) are fixed as a distributing surface for the ink, in combination with the increasing the number of impression cylinders and their inking rollers, and so to multiply impressions, as above described.—[*Inrolled in the Inrolment Office, October,* 1837.]

Specification drawn by the Patentee.

[The above is a literal copy from the record, and the plate is a specimen of the original drawing: it is to be regretted that so imperfect a document should have been inrolled of an invention said to possess considerable merit.—EDITOR.]

To **Henry Quentin Teneson**, *late of Paris, in the kingdom of France, but now of Leicester-square, in the county of Middlesex, gentleman, for an improved construction of the portable vessels used for containing portable gas, and of the apparatus or machinery used for compressing such gas therein; and of apparatus or mechanism for regulating the issue or supply of gas either from a portable vessel, or from fixed pipes communicating with an ordinary gasometer, being a communication from a foreigner residing abroad.*—[Sealed 19th October, 1837.]

The specification commences by observing, that it has been usual to construct vessels for containing compressed gas, in a cylindrical form, with hemispherical ends; and that in the event of such vessel exploding, the whole of its contents was instantly thrown into the apartment. To obviate this, it is now proposed to construct receptacles for containing portable gas, by combining several smaller vessels in one case, and causing them all to communicate, by small pipes, with the burner; but sufficiently throttled at the exit to prevent a very rapid discharge.

In Plate II., fig. 1, represents, in elevation, a cluster of these vessels *a, a, a*, combined; fig. 2, is a top view of the same, and fig. 3, a horizontal section; the several vessels being bound together by an hexagonal bracing of iron, the upper and lower ends of the vessels being made to communicate with each other by bent pipes. The gas to be compressed into these vessels is forced in at the pipe *b*, at bottom, by means of a forcing pump of the ordinary construction used at portable gas-works, the exit pipe *c*, being at top.

By this construction of gas-holder, it will be perceived that should one of the vessels explode, the gas in the other vessels would require some time to escape, and, therefore, no serious injury would be produced by the explosion, as might be the case in the event of a larger volume of gas rending a vessel of larger dimensions.

The improved apparatus employed for compressing gas into receiving vessels is shown partly in a prospective view at fig. 4, and partly in section; the force for producing the required pressure being intended to be obtained by heat applied to the generating vessel, instead of adapting a force pump as heretofore. The generating vessel or retort *a*, is built in a brick furnace *b*, *b*.

This generator or retort is cylindrical, and of wrought iron, made very strong, in order to resist internal pressure. A vessel *c*, containing oil, stands erect over one end of the retort, and oil is from thence let into the retort slowly by drops, through the stop cock. The gas generated in the retort escapes by the pipe *d*, and passes by another pipe *e*, to the reservoir *f*, whence it proceeds through a series of pipes *g*, *g*, *g*, to the several portable gas receivers *h*, *h*, *h*, placed upon a shelf above. The junctions of the pipes are all made particularly tight and strong, but capable of being readily detached when the vessels are sufficiently charged. The reservoir *f*, is furnished with a barometrical tube *i*, and graduated scale, in order to indicate the pressure of the gas within, and also with a safety valve *k*, loaded according to the required pressure.

It is only necessary to add, that as the oil descends into the retort, the heat of the furnace will decompose it, and generate the gas; and as the process goes on, the furnace being greatly raised in temperature, and the gas not having any escape, will accumulate and increase in density both in the retort and in the reservoir *f*; consequently, in that condensed state, it will be forced into the receiving vessels *h*, *h*, *h*, and become compressed in volume in those vessels without the assistance of a forcing pump; and in order that the pressure upon the oil in the vessel *c*, shall be the same both above and below, a pipe *l*, is carried round from the pipe *d*, into the upper part of the oil vessel.

The apparatus for regulating the issue or supply of gas, either from a portable gas-holder or from an ordinary gasometer, is represented in different modifications at figs. 5, 6, and 7: that apparatus shown at fig. 5, is a vertical section, designed for regulating the supply of the burner of a portable gas vessel; *a*, *a*, is a tight box of metal; *b*, is the pipe through which the gas passes from the gas-holder, wherein it is held in a condensed state. A small horizontal passage is made in the plate at *c*, for the gas to proceed through, having a very small aperture at its end, into which a piston valve of steel or agate is inserted.

This piston valve is attached to the shorter arm of a lever *d*, having a strong spiral spring *e*, at its reverse end, which keeps the long arm of the lever down, and consequently the valve raised, and the gas-way open. Above this, a gas-tight flexible diaphragm *f*, is extended across the box, and to the centre of it a disc *g*, is attached, from which a perpendicular rod extends, connected to the longer arm of the lever *d*. An aperture through the side of the box allows the gas to proceed by the pipe *i*, to the burner.

When the gas, having passed through the valve and filled the chamber between the plate *c*, and the diaphragm *f*, is exerting a greater elastic force than is required for its limited discharge at the pipe *i*, to the orifice of the burner, the diaphragm *f*, will be raised sufficiently to cause it to lift the longer arm of the lever *d*, and thereby to depress the valve at the end of its shorter arm, and partially to close the aperture through which the gas passed into the chamber. Thus the extent of opening of the valve is determined by the rising and falling of the diaphragm, and consequently, when the gas exerts any undue pressure, its escape is restrained, and the pressure at the aperture of the burner thereby regulated.

Fig. 6, is a vertical section of an apparatus nearly the same in construction as that above described; in fact, the only essential difference consists in the piston valve being placed horizontally, the lever *d,* and diaphragm *f,* acting nearly in the same way as above described.

The apparatus shown at fig. 7, is designed as a regulator for the supply of gas at the ordinary pressure; it is contained in a close box, divided into upper and lower compartments by a horizontal partition *a,* the lower chamber having a vertical partition, which separates it into two compartments *b,* and *c.* A quantity of water is placed in the lower chambers *b,* and *c,* which has free communication from one to the other by an opening at bottom.

A float *d,* is placed upon the water in the chamber *b,* having a rod carried up to one end of a lever *e,* mounted on a stationary fulcrum, the opposite end of which lever supports a conical valve *f,* acting in a conical aperture through which the gas is intended to be discharged.

The gas is admitted into the upper chamber of the box by a pipe *g,* and passes thence through the aperture of the valve *f,* to the pipe leading to the burner; but in the event of the gas exceeding the required pressure, its elastic force will exert itself upon the surface of the water in the compartment *b,* and cause a portion of the water to flow into the compartment *c,* by which means the float *d,* will be made to descend and to draw down the end of the lever *e,* raising the conical valve at its reverse end into the exit aperture; and hence, by partially closing the aperture, regulate the supply of gas to the quantity and force required.

A small glass tube *h,* is placed on the side of the box, to show the height of the water and consequent pressure of the gas within; and a stop cock *i,* is also inserted into the box, for the purpose of enabling the gas to blow clean through when the apparatus is set to work.

"Having now described the several parts of the said invention, and the manner of carrying the same into effect, I do hereby declare that I restrict my claim of exclusive privilege under the aforesaid in part recited Letters Patent to the following particulars; that is to say, firstly, to the combination of several small vessels into one compound vessel or apparatus, as applied to the construction of portable vessels or apparatus for containing compressed gas, in the manner which I have hereinbefore described; secondly, to the combination of parts constituting the apparatus which I have described in reference to fig. 4; thirdly, to the combination of a lever and valve rod connected with parts acted upon by the pressure of gas within a regulator, in the manner described in reference to figs. 5, and 6; and lastly, to the combination of parts constituting the apparatus which I have described as fig. 7."—[*Inrolled in the Rolls Chapel Office, April,* 1838.]

To Goodwin Embrey, *of Lane Delph, in the parish of Stoke-upon-Trent, in the county of Stafford, potter, for his invention of certain improvements in ornamenting of china, glass, and earthenware.*—[Sealed 14th April, 1835.]

This invention appears to us to possess but a very slight degree of novelty, the whole of the invention consisting in adding a little gum to the ordinary composition at present in use among potters, and known by the name of gold lustre, for gilding china and earthenware; but for what purpose this ingredient is added, the specification does not inform us.

The Patentee states, that he takes six ounces of gold and six grains of grain tin, and dissolves the two metals in one pound of nitro-muriatic acid; then, in another vessel, he puts two pounds of balsam of sulphur, and one pound of oil of turpentine, and mixes them together by means of a gentle heat. He then pours gradually the first mixture into the latter, stirring the two together, in order to bring them into perfect combination: he then thickens this mixture, by adding boiled oil and gum until it arrives at the proper consistency.

With this material as an ink, he then transfers the design or pattern from the copper-plate or wood-block to a sheet of the paper, such as is commonly used for this purpose, and from the printed paper communicates the design to the china or earthenware, which is then burnt and burnished in the ordinary manner.

In conclusion, the Patentee states, that he does not claim any part of the process at present known and in use, nor any part of the process hereinbefore described, save and except the addition of the gum to the ingredients for making the gold lustre; neither does he claim the transferring of the pattern from the engraved plate to the china. —[*Inrolled in the Inrolment Office, October,* 1833.]

To Robert Cattle, *of Grove House, in the county of York, Esq., and* William Greaves North, *of the suburbs of the city of York, gentleman, for their invention of an improvement in the construction of fire engines.*—[Sealed 4th December, 1832.]

The object of the Patentees is to work fire-extinguishing engines by rotary power, instead of the reciprocating or pumping lever action by which they are usually actuated.

The Patentees are of opinion, that working by rotary power will greatly facilitate the pumping operation, and considerably reduce manual labour.

There does not appear to be any features of novelty in the internal construction of the pumps, air vessels, pipes, or valves, but merely some difference in their arrangements, and the addition of toothed wheels and pinions worked by a winch or winches, and governed by a fly wheel. The whole of the mechanism is enclosed within a case suited to its shape, and is worked by one or two men on the outside.—[*Inrolled in the Petty Bag Office, June,* 1833.]

To JAMES LEMAN, *of Lincoln's Inn-fields, in the county of Middlesex, gentleman, for an invention for making, mixing, compounding, improving, or altering of soap, being a communication from a foreigner residing abroad.* —[Sealed 4th June, 1835.]

THIS invention is for making what the Patentee denominates chlorated soap, which is effected by mixing or introducing with the saponaceous ingredients chlorate or oxymuriate of soda, or chlorate or oxymuriate of potash, or chlorate or oxymuriate of lime—or chlorine gas may be conveyed into and caused to mix with the saponaceous ingredients, if it be preferred to use the gas instead of the earthly chlorates; or chlorated water may be used.

The Patentee concludes his specification, by saying that he claims the introduction of chlorine into soap, in whatever shape or way it may be used.—[*Inrolled in the Inrolment Office, December,* 1835.]

To ALEXANDER BEATTIE SHANKLAND, *of Liverpool-street, in the city of London, gentleman, in consequence of a communication made to him by a foreigner residing abroad, for a new method of spinning flax and hemp by means of machinery.*—[Sealed 13th April, 1832.]

THIS is a peculiar construction of apparatus principally, if not entirely, designed for making ropes. The description is extremely long, but yet might have been more explanatory; as there are some essential features not sufficiently set out, and others considerably confused by erroneous references and misnomers.

As far as we have been able to understand it, a quantity of flax or hemp appears to be intended to be attached to, or bound round, a drum covered with wire cords. The surface of this drum is of an irregular curved form, though called a cylinder; and it is made both to revolve upon its axis slowly, and to move laterally or endwise, in order to present successively to the spindle the fibrous material spread over all parts of its periphery.

The spindle is a solid bowl-shaped block, having a peculiarly cut toothed wheel mounted on its side, and, as the spindle revolves, the points of this wheel catch hold of portions of the fibres of the flax or hemp, and draw them off the feeding drum. These fibres being twisted, are conducted upwards through a slit or groove in the side of the spindle to the drawing rollers above, from whence the cord so made is led to a revolving reel, which winds it up as it is produced.

All the parts of the machinery, such as the feeding drum, the spindles, the drawing rollers, and reel, are actuated by bands passed over pulleys from a first mover, and are made to revolve according to their several required speeds.

The portions of fibre successively taken from the feeding drum by the points of the wheel in the spindle, become combined into one cord as the spindle goes round, the eccentricity of the cut or groove in the side of the spindle acting as a flyer, which twists the fibres together, and the rotation of the drawing rollers above gradually carry up the cord thus formed, which is from thence taken and wound upon the slowly revolving reel.

It is unnecessary to describe the details of the machinery further, as they partake of the same character as other roving and spinning machines; the essential feature of novelty is obviously the star wheel mounted in the side of the spindle which feeds the fibre from the periphery of the drum.—[*Inrolled in the Inrolment Office, October*, 1832.]

To WILLIAM HINCKES COX, *of Bidminster, near Bristol, tanner, for his invention of an improvement or improvements in tanning hides and skins.*—[Sealed 15th September, 1836.]

THE Patentee commences his specification by describing the disadvantages of the different modes of tanning at present in use, and then points out the beneficial effects which will result from the adoption of his improved method of tanning. He first informs us that the ordinary method of tanning, and that process which is now most generally in use, is by subjecting the skins or hides after they have been deprived of the hair, to a process of steeping in pits, until, by the action of the tanning liquor, the hides or skins may be considered to be sufficiently tanned, which will be readily known to any person who is conversant with this branch of manufactures.

Now, this process of tanning is one which takes a long time, generally several months, before the skins or hides are considered to be tanned sufficiently; and many schemes have been proposed and tried, by means of which the duration of this process might be considerably shortened, and even confined to a few hours. Among others, one method proposed was, by joining two skins or hides together at their edges, by means of metallic clumps or frames, and thereby forming a sort of bag, into which the tanning liquor was poured, and by hydrostatic pressure forced through the pores of the skins or hides.

This process, however, is liable to serious objections, as the effect of the pressure would be to distend and strain the skins or hides, and separate the particles of which they are composed, and by this means considerably weaken them, owing to their being supported by the metallic clamps at their outer edges only. Now, this is highly prejudicial to the object to be accomplished, it being desirable rather to condense the skins or hides than distend them; and this evil is still more seriously apparent, when there are any weak places in the skins or hides; so that the advantages which may appear to result from this process, are more than counterbalanced by the disadvantages that have been pointed out.

Since this method has been put into operation, and found to fail, from the causes hereinbefore stated, another method has been tried, which although not quite so injurious, is still liable to the same objections, viz. the distension of the skins or hides, when the hydrostatic pressure is employed: for the plan is supporting the sides of the hides or skins by rigid bars of iron or wood with spaces between them. It was supposed that these bars would counteract any prejudicial strain which the hydrostatic pressure might occasion; but by this apparatus the skins or hides are only partially supported; those parts which are not actually in contact with the bars are consequently unsupported, and bag between the bars, which causes those parts to be distended by the pressure, whilst those which are supported by the bars are not so effectually acted upon by the tanning liquor; and although to remedy this latter evil it was proposed to shift the position of the skins or hides so as to make the tanning liquor act equally on every part, yet no even effect could be obtained, and thus this process was rendered but very imperfect.

The Patentee now proceeds to inform us that his invention consists in fastening or sewing together two or more hides or skins, so as to make a bag to contain the tanning liquor, and supporting the sides of the hides or skins by means of fibrous materials, which, while they give the required support, yet allow the tanning liquor to ooze out or percolate through the skins and pass away, the fibrous materials being sufficiently pliant to accommodate themselves to the shape or figure of the bag or skins, without allowing one part to be subjected to a greater pressure than another.

The Patentee also states, that the material which he prefers to use, and which by experiment he has found to answer the purpose best, is a sort of coarse canvass of rather an open texture, such fabric being suitable for giving a close and equal support to every part of the bag composed of the hides or skins, and also admitting of a free passage of the liquor, and allow it to flow away after it has percolated through the pores of the hides or skins.

The improved process is thus described:—I take a skin or hide that has been previously prepared with a backward ooze, for the purpose of bringing it into a suitable condition for receiving a stronger liquor, and of giving it a good leather colour. The outer edges are to be sewed together tightly with well waxed thread, for the purpose of forming a bag, a small opening being left at one end for the purpose of introducing the tanning liquor; and should any holes be discovered, they must be sowed up, when the bag will be ready to be hung up to receive the tanning liquor.

The Patentee prefers having the flesh side of the skins inwards, as more calculated to receive the tanning liquor with facility.

The hides or skins being thus made into a bag, are then suspended from two hoops in such a manner that they may hang clear from the ground; and gutters should be made beneath them for the purpose of receiving the tanning liquor, which oozes through and drops on to the ground, in order to convey it into pits or tanks made for that purpose. A covering of coarse canvass is then to be placed round each bag, in the edges of which eyelet-holes are made for a lacing string, so that the canvass bag or covering can be drawn up and laced closely round the hides, and an equal support is afforded on all sides.

The bag or skin is then to be filled with the tanning liquor, which is conveyed to it by a pipe from a tank placed in a suitable situation for that purpose; and in order to carry on the process with expedition, a suitable shed or building should be conveniently arranged for having a number of these bags hanging in a row, in such a manner that one pipe running along the extent of the shed, and supplied with suitable branch pipes, might supply the whole number of the bags, each branch pipe being supplied with a stop cock for turning on or cutting off the tanning liquor.

The branch supply pipe to each bag should be inserted into the opening at the top of the bag, and the skin tied tight round it to exclude the air; and each bag must be furnished with a stop cock at the top, which should be open while the tanning liquor is running into the bag, for the purpose of allowing the air in the bag to escape.

The supply pipe being thus inserted into the upper part of the bag, the pressure of the tanning liquor will be as the perpendicular height of the column, the liquor will percolate through the pores of the skin, and rapidly produce its effects thereon. As the liquor oozing through the pores of the skins, with the leakage that may take place, tends to lessen the quantity of liquor in the skins, so its place will be supplied from the tank through the open supply pipe.

The time that may be allowed for completing the process will, of course, depend on the nature, thickness, and quality of the hides, and perhaps from other causes, as is generally the case in the process of tanning; but any person who is conversant with the process, will readily know when the desired result is obtained; but the operator may know with certainty what effect is produced by cutting away a small portion of the outer surface of the skin.

When the hides or skins are deemed sufficiently tanned, an aperture is made at the bottom of the bag by cutting away some of the stitches, and the tanning liquor allowed to flow out; the edges are then cut off, and the skins afterwards dried and finished in the usual way.

The Patentee says, in conclusion, "having now described the nature of my invention, and the manner of carrying the same into effect, I would remark that other materials may be employed for making the canvass covering for the bags than that above described, without departing from my invention, though I consider the material above described to answer the purpose best; therefore, I do not intend to confine myself to any particular material for covering or giving support to the hides or skins; and I would also have it understood, that I lay no claim to the forming of hides or skins into bags for the purpose of suspending them, and causing the tanning liquor to percolate through;

nor do I lay any claim to giving external support to the skins, when this support is given by rigid bars or surfaces pressing on parts and leaving other parts unsupported, and by this means producing an unequal effect; but what I claim as my invention is, the application of a covering or support made of fibre, which is capable of giving an even and close support to all parts of hides or skins on one side thereof, when pressed on the other side by the tanning liquor, at the same time such cover of fibres will allow of the tanning liquor readily flowing away through it after having passed through the pores of the skins or hides, as above described."—[*Inrolled in the Inrolment Office, March,* 1837.]

To LEOPOLD FOUCARD, *of George-yard, Lombard-street, in the city of London, merchant, for an invention communicated to him by a foreigner residing abroad, of an improvement or improvements applicable to the priming of percussion locks for guns.*—[Sealed 2d November, 1832.]

THIS invention is a magazine, intended to contain a number of copper caps, having the detonating composition within them, which is so situate, that by depressing the magazine (formed as a lever) a priming cap may be readily made to attach itself to the nipple of the gun or pistol.

Plate III., fig. 1, represents the side of a gun with the lever magazine *a*, applied to the lock plate by a fulcrum pivot *b*, the magazine being shown in section, in order to exhibit the form and construction of its interior. Within the lever the groove *c*, *c*, is formed, sufficiently long to hold about twenty detonating caps, all of which, in the first instance, are to be carefully placed side by side in the groove in erect positions, the open part of each cap being downwards. The groove is made nearly to fit the caps, allowing them space to slide easily along; and at the back part of the groove a worm spring *d*, is placed, which, by acting expansively, forces the whole series of caps (however many there may be) toward the outer end of the lever. By these means, as long as there are any caps remaining in the magazine, there will always be one standing opposite to the aperture *e*, over the nipple *f*.

By depressing the lever *a*, the aperture *e*, will be brought down upon the nipple, and cause that one of the caps which is opposite to the aperture to attach itself firmly to the nipple as a priming, and when the sportsman removes his thumb from the lever, a spring *g*, will throw the lever up again out of the way of the cock.

The Patentee claims the application and use of such an instrument as the above set forth and described as applied to fire-arms, by which the priming may be more easily applied to guns and pistols than by hand.—[*Inrolled in the Petty Bag Office, May*, 1833.]

To WILLIAM HARROLD, *of Birmingham, in the county of Warwick, merchant, for an invention communicated to him by a foreigner residing abroad, for an improvement or improvements in machinery for making or manufacturing paper.*—[Sealed 11th January, 1833.]

THIS invention applies to the construction of a roller for dressing the pulp for making paper, and is principally designed to separate the knots and lumps in the pulp from its fine fibres.

The roller is formed with teeth or grooves in the peculiar shape represented in Plate III., at fig. 2. One side of each tooth or groove is in a radial line from the axis of the roller; the other side is oblique, and forming a right angle to the former. This roller is to be properly mounted, for the most part under the water line in the pulp vat, and made to revolve by any ordinary means.

The face of each tooth is to have fine grooves cut in order to let the pulp, with the water, pass through to the hollow axle, whence the pulp may be delivered into the moulding vat; all knots and lumps remaining in the pulp, in consequence of their being unable to pass through the fine cut grooves in the face of the teeth.

It is also proposed to construct the roller of a series of thin plates of metal placed in coincidence, and very nearly in contact, that is, leaving but very narrow spaces between each plate for the fine fibres of the pulp and water to flow through; and the distances of the plates apart may be made adjustable, so as to regulate them by a screw, according to the quality of the paper intended to be made.—[*Inrolled in the Petty Bag Office, July,* 1833.]

To HENRY BARON DE BODE, *Major-General in the Russian service, now resident at Edgeware-road, in the county of Middlesex, for his invention of improvements in capstans.*—[Sealed 4th June, 1836.]

THIS invention purports to be a new method of creating a sufficient degree of friction on the surface of the capstan, to prevent the cable, whether of hemp or chain, from slipping, when any great weight, such as an anchor, is being raised; and, consequently, avoiding the danger and delay which such slipping of the cable would occasion.

According to the ordinary construction of capstans, it is necessary to employ a number of men holding on the cable, and causing it to bind round the capstan, in order that when the capstan revolves it may drag the cable with it.

This invention consists in a mode of producing the necessary degree of friction on the surface of the capstan, and of carrying the cable round with it, without the necessity of employing the hands to haul on.

Plate III., fig. 3, is an elevation of a common capstan, with these improvements adapted to it: *a*, *a*, are blocks made of iron, and attached to the bottom of the capstan, and against which the cable is made to bind, by other metal blocks *b*, *b*, placed between the blocks *a*, *a*. The cable is kept in its place by a roller or pulley *c*, which forces the cable into its proper place, and keeps it there, by a man holding the rope *d*, tight.

It will be seen by inspecting the figure, that the cable is made to perform a tortuous course, by passing under the blocks *a*, and over the blocks *b*; and thus, by creating a very considerable degree of friction, effectually prevents the cable from slipping.

The Patentee says, in conclusion, having described the nature of his invention, and the cheapest and best method with which he is acquainted of carrying the same into effect, he claims, as his invention, held by Letters Patent, the holding the cable, rope, or chain, so firmly on the capstan during its rotation, that it cannot slip during the operation of weighing the anchor, or of raising heavy weights; and further declares, that he does not confine himself to the precise arrangement herein shown, as the same may be beneficially varied without departing from the principle of the invention; and he also wishes it to be understood, that he claims the arrangement of the apparatus thus described as applied both to land and sea service. —[*Inrolled in the Inrolment Office, December*, 1836.]

To JOHN WHITE, *of the town of Southampton, engineer and iron-founder, for his invention of certain improvements in machinery, to be worked by steam or other power, applicable to raising water and other purposes.*—[Sealed 28th March, 1833.]

THIS is a rotary engine, which, like most other engines on a rotary principle, are proposed to be worked by the elastic force of steam, or the pressure of water, or may be driven by other means, and be made an engine for raising or forcing water.

We have not found the description so clear and intelligible as might be wished, neither do the drawings appear to be very accurately made; therefore, to avoid the possibility of greater errors, we give the words of the Patentee.

Plate III., fig. 6, is an elevation of the engine, the outer case being in section to exhibit the exterior; fig. 7, is an end view of the same, the outer cap or end plate being removed. A roller *a*, which I call the driving roller, has four projecting rings *b*, *b*: this roller *a*, being thus divided into three compartments *c*, *c*, *c*, to each of which compartments there is an induction way for the passage of water into the compartments *c*, and also an eduction way for the water to escape from the compartments *c*; *d*, *d*, *d*, are three pistons, one across each of the compartments *c*; *f*, is what I call the abutment roller, which is of the same diameter as the roller *a*, and travels at the same speed with it, by means of two equal-toothed wheels *g*, *g*, placed on the axle of each of these rollers *a*, *f*.

It will be seen that the roller *f*, is divided into three parts, which accurately fit into the compartments *c*, *c*, *c*: on each of the three parts of the roller *f*, is formed a recess at a part opposite its perspective piston, and thus, as the two rollers revolve, the pistons will successively come to the recesses formed on the roller *f*; and as the pistons are of equal distances on the circumference of the roller *a*, there will at all times be two of the pistons acting when one of them comes opposite its recess.

The induction way is at *f*, formed through the end of the roller *a*, and extends as far only as the first compartment *c*, and is on one side of the piston of this compartment; *i*, is the eduction way, which is formed in the roller *a*, and proceeds from the first compartment *c*, to the other end of the roller *a*, and is on the other side of the piston; it consequently follows that any water which may be in the first compartment *c*, will, by the revolution of the rollers *a*, and *f*, be forced by the piston to pass through the eduction way *i*, as the water will be prevented passing between the rollers *a*, and *f*, at the parts where they touch.

The second compartment *c*, has an induction way formed in the roller *a*, from the same end of the roller as that to the first compartment; and this second compartment *c*, has also an eduction way, which passes from the second compartment to the other end of the roller *a*; and a like arrangement is formed for the third compartment: by this means the fluid is received in at one end of the rollers, and passed off at the other end of the rollers.

The induction and eduction ways being formed in the roller *a*, at the time of casting, they are merely openings lengthwise with the roller *a*, into the compartments *c*, and from the compartments *c*, to the other end of the roller *a*. The induction and eduction ways to each of the compartments *c*, are divided by the pistons, so that the fluid cannot pass from one to the other till the rollers have made a revolution; and thus the machinery or apparatus, when worked for the purpose of raising or forcing water, by causing the rollers *a*, and *f*, to revolve by any power applied to one of the axles, becomes a very efficient means of forcing water. It should be observed, that the lower part of the casing *k*, should be accurately bored, and the rings on the roller *a*, packed in such manner as to prevent the passage of water from one compartment to another.

The induction chamber at one end of the machine is shown at *n*, into which the three induction ways open to the three compartments *c*; and *o*, is the eduction chamber, into which three eduction ways *i*, enter at the other end of the roller *a*. Now, it will be evident that if the pipe *p*, communicates with a well, and rotary motion be given to either of the axles of the rollers *a*, *f*, a continuous stream of water will be constantly forced through the pipe at *q*; and it will be further evident that more or less compartments *c*, may be used, provided they have separate induction and eduction ways, as above described.

Having now described one part of my improvements as they relate to raising water, I will proceed to show how the same may be actuated by steam, and perform the purposes of a steam engine; and in this case the parts, as described and shown in fig. 6, are to be constructed in like manner to that shown and described; but it will be necessary that greater care should be observed in making the whole of the parts most accurate and steam tight, and then it will also be necessary to provide means to lubricate the various parts; and for this purpose I place the trough *r*, containing oil, having proper openings to allow of the passage of small quantities of the same constantly dropping on the upper roller *f*.

The pipe *p*, is to be connected to a steam boiler, and become the steam pipe to the engine; and the pipe *q*, is connected to a condenser, (in case it be a low-pressure engine, but if a high-pressure engine, then the pipe *q*, is open to the atmosphere,) is the eduction pipe for the escape of the steam after it has performed its operation in the engine.

The steam entering the pipe *p*, fills the chamber *n*; and as the three induction ways formed in the roller *a*, enter into this chamber, the steam will pass into the three compartments *c*, and act on the pistons—the three parts of roller *f*, forming abutments against which the steam acts; but as the pistons arrive at their respective recesses in the roller *f*, the steam on the other side of the piston will pass through the eduction ways into the chamber *o*, and thence to the condenser, or to the open air, according to the description of the engine.

The second part of my invention, shown at fig. 8, in a plan view, is another arrangement of a rotary engine for forcing water and other fluids, and consists of two screws acting one in the other, caused to revolve with equal speeds by two toothed wheels placed on their axles. It will be evident that motion being communicated to either of the axles, will cause the screws *s*, *s*, to revolve towards each other; and the water coming in at *u*, will be forced in the direction of the screw, and be ejected at the point *v*.

The Patentee concludes by saying,—Having now described the nature of my invention, and the manner of constructing the same, I would have it understood that I am aware various attempts have been made to construct pumps and engines by means of two rollers revolving together, the one having recesses and the other projecting pistons; I do not, therefore, lay any claim to the same, but only the method of forming or constructing the induction and eduction ways, as above described, whether the same be used for forcing water, or as a steam engine, as above described.

And, secondly, I claim the apparatus or engine, consisting of a left and right-handed screw, combined and caused to revolve together, for forcing water or other fluids, as above described.—[*Inrolled in the Inrolment Office, September,* 1833.]

To Jacob Perkins, *of Fleet-street, in the city of London, engineer, for his having invented certain improvements in blowing and exhausting air, applicable to various purposes.*—[Sealed 9th June, 1832.]

This is a rotary blowing apparatus of a peculiar form, having the fans of the blower shaped like the section of a frustrum of a cone.

Plate III., fig. 4, exhibits the apparatus in section, consisting of an outer case *a, a,* enlarged in the part where the rotary fan *b, b,* is situate, and contracted into a nozle at *c,* for the purpose of guiding the volume of air intended to be forced into the furnace. There is also a partition *d, d,* forming the curved channel, as a guide to the blast.

The rotary fan *b,* has four, or any other number, of vanes fixed radially upon an axle *e,* which turns in bearing in the case, and is made to revolve, by any convenient means. The atmospheric air passes into the apparatus through apertures at *f, f,* as shown by the arrows, and by the rotary action of the fan wheel *b,* is forced through the curved channel, and out at the nozle *c.*

This arrangemeet of the apparatus, it will be perceived, is only calculated for injecting a blast of air into a furnace; but a similarly contrived rotary fan might be adapted for exhausting the air, smoke, and vapour, from the flues of a furnace, by placing the apertures *f, f,* in connexion with the flue, when the rotary action of the fan would draw the air, smoke, and vapour through the apparatus, and eject it at the mouth or nozle *c.*—[*Inrolled in the Inrolment Office, December,* 1882.]

To Charles Axon, *of Heaton Norris, in the county of Lancaster, cotton manufacturer, for his invention of a certain improvement in the machines called throstles and doubling frames, for spinning, doubling, and twisting yarns made from cotton, silk, linen, woollen, and other fibrous substances.*—[Sealed 1st May, 1832.]

The object of this improvement is, to prevent the vibratory action of the spindle and bobbin when revolving with very great velocity. The construction of the throstle frame is scarcely varied from those of the ordinary kind; but in the present instance, instead of the bobbin being made to rise and fall upon the spindle by the action of a moveable copping rail, in order to wind the yarn in uniform helical curves round the bobbin, the spindle is made to pass loosely through the bobbin, and with the flyer to rise and fall, for the purpose of effecting the same object.

The manner of carrying the Patentee's intentions into effect, as exhibited in the specification, is shown in a detached view, at Plate III., fig. 5: *a, a,* are the stationary front rails of the throstle frame; *b,* the spindle passing through them, and through the bobbin *c,* and having the flyer *d,* fixed at top. A moveable rail *e,* supports the lower end of the spindle, which rail is attached to a vertical sliding rod *f.*

This rod *f,* is held up by a chain *g,* made fast to a shaft *h,* and, consequently, by the reciprocating rotary movements of the shaft *h,* the vertical rod *f,* the rail *e,* and the spindle *b,* with its flyer *d,* are made to rise and fall, whilst the bobbin *c,* bearing upon the upper stationary rail *a,* retains its position, and the yarn, as the spindle goes round, is wound in uniform helical coils up and down the barrel of the bobbin, without subjecting the spindle to that vibratory action which would take place if the bobbin was made to slide up and down upon the spindle.—[*Inrolled in the Inrolment Office, November,* 1832.]

[If we mistake not, this contrivance has formed part of the subject of, at least, half-a-dozen previous patents.—EDITOR.]

To JOHN HORNBY MAW, *of Aldermanbury, in the city of London, surgical instrument maker, for his invention of certain improvements in the form and arrangement of parts of an apparatus for ejecting enemata.*—[Sealed 17th December, 1832.]

THIS is a slight modification in the construction of an apparatus for injecting liquids into the human body, for medical purposes. The apparatus is a close box, having a cistern and forcing pump, with a prolonged tube or jet for conducting the liquid from the pump to the patient. The internal parts of the apparatus are not proposed to be varied from the ordinary construction of such injecting pumps, but the jet pipe is made to turn up upon a joint, in order that it may be commodiously enclosed within the box when not in use. This turning up of the jet pipe and enclosing it within the box, is the whole subject of the patent.—[*Inrolled in the Inrolment Office, June,* 1833.]

SCIENTIFIC NOTICES.

HARBOURS OF REFUGE, ON A NEW PRINCIPLE.

BY WILLIAM TAIT, CIVIL ENGINEER.

(From the *United Service Journal* for Sept. 1838.)

AFTER the many and expensive efforts that have been made at Dover Harbour, and the science and skill exerted, with very nearly as little success, at Folkstone, to deflect the shingle past the entrances of these harbours, it appears almost an hopeless task to make any further attempts on the principle that has directed these endeavours. At Folkstone, indeed, the principle may be deemed to have been carried by the late Mr. Jessop to its utmost limits. The result, however, has invariably been, that, whenever the angle formed by the shore and windward pier is filled up with shingle, it finds its way into the mouth of the harbour, forming a bar, whenever the wind and tide co-operate in a particular manner.

I have no faith in the *scouring* by back-water, directed through cylinders; it is, at best, found to produce but a temporary advantage; a mere remedial measure, the effect of which may continue to last only perhaps during the next tide, or not even so long; for should the wind immediately shift round some points, as from S.W. to S.E., nearly all the shingle would be thrown back into the mouth of the harbour, and form a bar almost as formidable as at first. This has often happened, and may, therefore, happen again, with more or less frequency, and at times, too, when the obstruction to the entrance of vessels may be attended with the most disastrous consequences. Besides, the *artificial* scouring here alluded to can only be used *during spring tides*. At other times there is not a sufficient head of water to have any effect on the bar; and it unfortunately so happens that it is chiefly during *neap* tides that a bar is thrown up at the mouth of the harbour, when, if no other means of removing it be employed than by what is termed "the *scouring power*," it must remain, obstructing egress or ingress, until the spring tides come round! This is a comfortable state of affairs to remain quietly and tamely under.

In designing a harbour on a principle *differing entirely* from that hitherto followed, and applicable especially to a sand or shingle coast, I have been guided by my own personal observation (while stationed for several years on the Kentish coast) on the mutations of the shingle, as well as by the remarks made on this subject by that intelligent engineer, Mr. H. R. Palmer, in a paper read before the Royal Society, on the 10th of April, 1834.

Mr. Palmer has classified the actions of the sea and wind upon the loose pebbles into three kinds. The first, heaping up, or accumulating the pebbles against the shore; the second, breaking down or disturbing the accumulations previously made; and the third, removing or carrying forward the pebbles in a horizontal direction.

It is not necessary for our present purpose to enter into any detailed account of these several actions; it will be sufficient to call attention to one important fact, as having particular reference to the plan now proposed; namely, that when the shingle, in its transition, has to pass through a *narrow gorge*, or rebounds against a bold rocky shore (in place of being spread over a lengthened sloping bank, *suited to its deposit*), it continues to be borne along, and to travel onward; for this obvious reason, that the water, moving forward in a body, possesses ample power to force the rolling mass of pebbles away with it in its course: whereas, in the accumulative action, the waves after striking the pebbles in an upward direction, become dispersed in receding over a gently-inclined and equal surface, and are incapable, in their exhausted recoil, of returning them to the level from which they were forced; wherefore they do not move on, but are accumulated in heaps, and become the source of impediments and difficulties.

In this way is pointed out by nature herself *a principle* upon which the shingles may be assisted to pass forward, and their accumulation in any particular place prevented.

Upon *this principle*, then, the chief object to be had in view, it is evident, will be to obviate the recoil of the waves in a *dispersed* form, and to conduct them onward *in a confined column*, so as that they may retain sufficient strength to bear away the shingle along with them in their course, in order to prevent it from accumulating at any projection traversing the line of its progress, such as the angle formed by the windward pier with the shore; and then, after that angle is completely filled, and can hold no more, passing round and depositing itself within the harbour, and at its mouth, as at present continually happens, to the more or less interruption of its commerce.

These desirable and most important objects, it is presumed, may be attained by the construction of a harbour *on a principle of* ISOLATION. The site of such a harbour may be chosen on almost any point of a sand or shingle coast; a salient point would, no doubt, be the most favourable for our purpose, although it might be formed in a bight, if found to be peculiarly suitable in other respects. It is impossible to be more explicit here; indeed, it would be improper to give any general plan, without first seeing the spot at which it were meant to construct a harbour on this or, in fact, on any principle.

It will be evident that, if the projected harbour be completely isolated, and a free and efficient passage left for the shingle to travel uninterruptedly between it and the shore, and aided by a revetment on the shore, it will be impossible for any accumulation to take place, either to windward or to leeward, or before the entrance of the harbour, to interfere with the freedom of ingress or egress at any time; but that it must be carried clear away by the confluence and joint action of the artificial and natural currents to leeward of the harbour. This, as must be obvious to any one at all acquainted with the nature and action of currents of water, and having any experience regarding the movements of shingle, is a matter entirely dependant on the figure we give to the harbour, combined always with a due regard to the several localities and circumstances at the spot.

In the construction of an harbour of this description, it is not to be concealed that some additional expenditure may, perhaps, become requisite, but great advantages are not to be obtained without a corresponding sacrifice. And it may be observed, that the expense of its formation is all that it will be necessary to incur; for if the harbour shall have been placed in a judiciously selected locality, and well and carefully executed at first, little further disbursements will be required; for the work will be in all its intentions complete. A small annual sum, however, it is evident, must be applied to the purpose of repairs and other incidental circumstances.

An harbour upon the principle now proposed, where a *not* too great, but sufficient depth of water can be found, at a reasonable distance from the shore, may, as has been already stated, be constructed on almost any point of a shingle coast. The question then will be, not as heretofore, in looking for a site, "Where are we to find a place where nature has already formed a kind of imperfect harbour at the *debouchure* of a stream or streamlet, to assist our efforts, and enable us to construct one at the least expense?" but, at what point of a dangerous shingle shore, and particularly where there is no stream or back-water, it may be most suitable for the reception and secure protection of vessels in distress? There we plant an isolated harbour of refuge.

The breakwater of an harbour thus constructed would afford a certainty of ingress and safety, under all circumstances, and at all times of tide, to vessels drawing 22 feet water; for, in short, it is only by carrying the mouth of the harbour into a suitable depth of water, and consequently at an additional expense, that a shelter for vessels of any tonnage may be obtained.

The figure of the isolated harbour will, of course, be modified according to a variety of local circumstances. The form best adapted, generally speaking, however, for the free passage of the shingle behind it, as well as to get rid of the shingle to leeward, is that in which the angle, formed by its longest sides, is made to rest upon the shore, presenting the shortest aperture for the passage of the shingle; and by means of the leeward side having a wedge shape, and thereby enabled to give a slanting direction to the natural current, so as to co-operate with the artificial stream in-shore, in carrying forward the shingle (after it has passed the harbour), and preventing the formation of a bank to leeward.

From the existence of several very awkward shingle banks, immediately to the eastward of Dover harbour (formed, in all likelihood, or aided considerably in their formation, by the remedial process of artificial scouring so much in vogue, and so much relied on in that port), no small degree of investigation into local matters, and much consideration and address would be necessarily employed before it could, with any degree of confidence, be adapted to Dover; that is, if the conservation of the present entrance to the harbour be an indispensable condition, a *sine quâ non*. Yet, notwithstanding of these untoward circumstances, a harbour, upon this principle, might still be constructed even there; but it would necessarily be of limited extent, its area not exceeding ten or twelve acres at high water. But this, or less than this, would perhaps be quite sufficient at that port as a packet station.

There are, however, several places not very distant from Dover, at which such a harbour as that now proposed might be constructed with *every* possible advantage, if totally independent of the present harbour at Dover.

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15, London-street, Fitzroy-square.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from p. 373, vol. xii.)

The minutes of the discussion on the brick beam having been read, Mr. Brunel stated, according to his experiments, continued during three months, every thing was to be attributed to the iron hooping. His experimental structure had cracked in several places, these cracks had been filled up with cement, and the arch had finally broken in a fresh place. Had the strength of the structure depended on the cement and not on the iron, the arch would have gone at first.

Mr. Brunel then described his method of measuring the tensile force of iron hooping in structures of this nature. To the under side of each of two pieces of wood, joined by a hinge, is attached a beam of brick and cement, with iron hooping. Weights are laid on the upper side of the wood at the joint, and supported simply by the tensile force of the iron.

On the Strata of Stone in the neighbourhood of Whitby.

By N. King.

This paper, accompanied by specimens of stone, in cubes, described generally the nature and properties of the stone from

Whitby. Specimens, similar to those presented, had been tested by a hydro-mechanical press at Messrs. Bramah and Robinson's, and their weights, and their fracturing pressures per square inch, are tabulated for the different kinds of stone.

March 13, 1838.

JOSHUA FIELD, V.P., in the chair.

On the Floating Bridge across the Hamoaze from Devonport to Torpoint. By James Rendel, M. Inst. C.E.

The floating bridge now described is used as a system of communication betwixt the opposite shores of the Tamar, a little to the north of Devonport. The width of the river at this site is 2550 feet, at high water, and its greatest depth at spring tides, 96 feet. The ordinary velocity of the stream is 3¾ knots an hour, but under heavy land floods it is increased to 5 knots. The line of passage is directly at right angles to the current; this, combined with the exposure of the site, and the rapidity of the current, rendered an attempt to apply a twin boat, similar to those at Dundee, a total failure.

The floating bridge is a large flat-bottomed vessel, of a breadth or width nearly equal to its length, namely, 60 feet long and 50 feet wide, divided in the direction of its length into three divisions; the middle being appropriated to the machinery, and each of the side divisions to carriages and traffic of all kinds. These side divisions have decks, raised from 2 feet to 2 feet 6 above the line of floatation; and carriages, horses, &c., pass on and off the deck by strong commodious platforms or drawbridges, communicating with the landing-places, and over which carriages of all kinds drive on and off the bridge without difficulty or inconvenience.

The bridge is guided in its passage by two chains, which, passing through it, over cast-iron wheels, are laid across the river, and secured to the opposite shore; thus forming, as it were, a road, along which the bridge is made to travel forward and back from shore to shore. The peripheries of the wheels are cast with sockets, fitted to the links of the chain, so that when the wheels are stationary the bridge is moored by the chains; when the wheels revolve, the bridge moves in the opposite direction. Two steam engines, of 11-horse power each, are employed to turn these wheels. The author then describes the details of the wood-work, and the dimensions of the several parts; the drawbridge and the landing-places, or inclined planes, formed on each shore; the galleries, the engine-house and machinery, the chains and balance weights, the accommodation and regulations of the bridge.

The peculiar feature in these works are the balance weights. There would have been great difficulties in fixed moorings; the ends of the chains are attached to weights, suspended in shafts sixteen feet square and twenty feet deep, sunk in the landing-place above high-water mark. The weights are cast in iron boxes, loaded with about five tons each. Thus the additional length, requisite when the vessel is in the middle of the river, is obtained. Were the chains fixed to the shores, they would be too short, and consequently unnecessarily strained at this time, or so long as to allow the vessel to make lee-way in her approach to the landing-place. This is altogether avoided by the balance weights; for as the vessel leaves the shore, the weights rise and the chains lengthen, so as to adjust themselves to an easy curve; and as it approaches the other shore, the balance weights on that side fall, the chains are shortened, and the drawbridges or platforms are brought straight and steadily to the landing-places.

The economy, both as regards first cost and annual expenses of these floating bridges, no less than their superior accommodation to every other mode of crossing estuaries, has already given Mr. Rendel the opportunity of establishing several: the latest was that at Southampton, across the Itchin ferry, over which there are twelve coaches daily, and great carriage traffic, although the public have the option of crossing a fixed bridge over the same river, and only a short distance farther round.

The Lords Commissioners of the Admiralty having sanctioned the establishment of a similar bridge across Portsmouth Harbour from Portsmouth Point to Gosport Beach, a bill is now before Parliament to incorporate a company for carrying the work into effect. The great national importance of this harbour, and the well-known jalousy of the Board of Admiralty in all matters, connected with its economy, furnish the best proof of these bridges, though requiring chains to be laid across the river, do not occasion the slightest impediment to the navigation or tidal currents.

The paper on the floating bridge having been read, Mr. Rendel stated that the chains were kept bright by the rubbing which they received on the bed of the river. The bed consisted of mud and not of gravel; the chains only scoured, and did not perceptibly wear. The chains which have been in use four years have not been sensibly diminished. They had tried chilled segments —these wore the chains; they consequently returned to good grey iron. Three sets of segments are worn out in the course of a year. In reply to a question respecting the deviation of the bridge under the action of the wind and current, Mr. R. stated, that he had never known it diverge more than by its breadth, or fifty feet; owing to the particular form of the bridge, and the small draft of water, the current had but little effect.

The usual weight of the balance boxes is five tons; but in hard weather it is usual to add a ton more. He conceived that no comparison could possibly be instituted betwixt the relative advantages of the floating bridge and the twin boat; the latter requiring very expensive wharfs—those at Dundee, for instance, having cost upwards of 25,000*l.*, and still there is much attention and care required in bringing the boats to their piers. But the floating bridge requires no such expensive appendages; the chains on which it works, when the wheels are in motion, becoming the most secure fastening when the engines are stopped. The chains also act as a pilot and crew; two persons only being required in a vessel of this kind, viz. an engine-man and one on the decks to attend to the drawbridges.

Mr. Vignoles remarked, that the plan now proposed would obviate many difficulties which occurred in the case of rail-roads; there were many situations in which the floating bridge might be adopted with great service, and he could not refrain from expressing his admiration of the great forethought, skill, and design, which were here exhibited—at the minuteness with which the details had been studied, and, not the least, the adaptation of the balance weights for the chains; the chains not having elongated, proves of itself how completely they answered their intended purpose.

Mr. Brunel stated that the new system of poling boards which he had exhibited to the Institution had been very successful. They had supported ground in which the water was as six to one; the water passed through them and the men pushed on; the men could not have stood to the work without them.

List of Patents

Granted in Scotland between 22d August and 22d September, 1838.

To Charles Dodd, of Craven-street, Strand, in the county of Middlesex, gentleman, in consequence of a communication made to him by a foreigner residing abroad, for an invention of certain improvements in the construction of railway tram-roads, and in the structure of the carriages to be used in the said railways or tram-roads, and also of certain apparatus applicable to the cleaning and preserving of railways and tram-roads.—23d August.

To Arthur Dunn, of Stamford-hill, in the county of Middlesex, gentleman, for an invention of certain improvements in the manufacture of soap.—24th August.

To Ambroise Ador, late of Leicester-square, in the county of Middlesex, but now of 29, Rue de Faubourg Mont Martre, in the city of Paris, and kingdom of France, chemist, for an invention of certain improvements on lamps or apparatus for producing or affording light.—28th August.

To Charles Phillips, of Chipping Norton, in the county of Oxon, surgeon, for an invention of improvements in apparatus or machinery for punching, bending, cutting, and joining metal, and for holding or securing metal to be punched, bent, cut, or otherwise operated on, parts of which machinery are adapted to perform some of these operations on other materials.—30th August.

To Job Cutler, of Lady Pool-lane, Sparkbrooke, in the borough of Birmingham, in the county of Warwick, gentleman, and Thomas Gregory Hancock, of Princes-street, in the borough of Birmingham aforesaid, mechanist, for an invention of an improved method of condensing the steam in steam engines, and supplying their boilers with the water thereby formed.—31st August.

To Charles Fitton, woollen manufacturer, and George Collier, mechanic, both of Cumberworth Half-Wakefield, in the county of York, for an invention of improvements in power-looms.—6th September.

To Charles Hancock, of Grosvenor-place, Hyde-park-corner, in the county of Middlesex, animal painter, for an invention of certain improved means of producing and applying figured surfaces sunk and in relief, and of printing therefrom, and also of moulding, stamping, and embossing.—13th September.

To Samuel Hall, of Basford, in the county of Nottingham, civil engineer, for an invention of improvements in steam engines, heating or evaporating fluids or gasses, and generating steam or vapours.—15th September.

To Joseph William Curtis, of Stamford-street, Blackfriars-road, in the county of Surrey, civil-engineer, for an invention of certian improved machinery and apparatus for facilitating travelling and transport on railways, parts of which are also applicable to other purposes.—17th September.

To Thomas Robinson Williams, of No. 61, Cheapside, in the city of London, civil engineer, for an invention of certain improvements in machinery for spinning, twisting, or curling and weaving horse hair and other hairs, as well as various fibrous substances.—18th September.

To Archibald M'Lellan, of the city of Glasgow, coach-builder, for an invention of certain improvements upon the springs and braces of wheel carriages, and upon the mode of hanging such carriages.—21st September.

New Patents

SEALED IN ENGLAND.

1838.

To John Keys, of Sutton, in the parish of Prescot, in the county of Lancaster, copper-smelter, and William Thompson Clough, of Eccleston, in the same parish, for their invention of a method or process for the manufacture of sulphuric acid from copper ore, copper regulus, and sulphuret of zinc.—Sealed 31st August—6 months for inrolment.

To Morton Balmanno, of Queen-street, Cheapside, in the city of London, merchant, for his invention of a new and improved method of making and manufacturing paper, pasteboard, felt, and tissues.—Sealed 6th September—6 months for inrolment.

To John Frederick Bourne, of Manchester, in the county of Lancaster, engineer, and John Bartley, jun., of the same place, engineer, for their invention of certain improvements in the construction of wheels to be used upon railways and other roads; and which improvements are also applicable to the construction of wheels in general.—Sealed 6th September—6 months for inrolment.

To Miles Berry, of 66, Chancery-lane, in the county of Middlesex, patent-agent, for certain improvements applicable to certain parts of the process generally used for the manufacturing and refining of sugars, being a communication from a foreigner residing abroad.—Sealed 6th September—6 months for inrolment.

To Timothy Burstall, of Leith, in that part of the United Kingdom called Scotland, engineer, for his invention of certain improvements in the steam engine, and in the apparatus to be used therewith, or with any other construction of the steam engine or other motive power, for the more smooth and easy conveyance of goods and passengers on land and water, part of which will be applicable to water power.—Sealed 6th September—6 months for inrolment.

To Henry Gibbs, of Birmingham, in the county of Warwick, button manufacturer, for his invention of an improved perforated button.—Sealed 6th September—6 months for inrolment.

To Joseph Brown, of the Minories, in the liberty of the Tower of London, upholsterer, for his invention of improvements in beds, sofas, chairs, and other articles of furniture, to render them more suitable for travelling and other purposes.—Sealed 8th September—6 months for inrolment.

To James Ulric Vancher, of Geneva, in Switzerland, but now residing at Manchester, in the county of Lancaster, gentleman, for his invention of certain improvements in fire engines, watering engines, and other hydraulic machines and apparatus for raising or propelling water and other fluids, some of which improvements are also applicable to steam engines.—Sealed 8th September—6 months for inrolment.

To Henry Dunnington, of Nottingham, lace manufacturer, for his invention of improvements on machinery employed in making framework knitting or stocking fabrics. Sealed 10th September—6 months for inrolment.

To Alexander Southwood Stocker, and Clement Heeley, manufacturers, of Birmingham, in the county of Warwick, for their invention of improvements in straps for wearing apparel.—Sealed 10th September—6 months for inrolment.

To Ambroise Ador, of Leicester-square, in the county of Middlesex, for his invention of certain improvements on lamps or apparatus for producing or affording light.— —Sealed 13th September—6 months for inrolment.

To Joseph Hall, of Over, in the county of Chester, plumber, for his invention of improvements in the manufacture of salt.—Sealed 13th September—6 months for inrolment.

To John Chanter, of Earl-street, Blackfriars, in the county of Surrey, Esq., and John Grantham, of Liverpool, engineer, for their invention of improvements in furnaces for steam boilers.—Sealed 13th September—6 months for inrolment.

To Edwin Bottomley, of South Crossland, in the parish of Almondbury, in the county of York, clothier, for his invention of a certain improvement or improvements applicable to power and hand looms.—Sealed 13th September —6 months for inrolment.

To Edward Massey, of King-street, Clerkenwell, in the county of Middlesex, watch-maker, for his invention of improvements in watches and machines for keeping time.—Sealed 13th September—6 months for inrolment.

To James Wapshare, of Bath, in the county of Somerset, gentleman, for his invention of certain improvements in the application of heat for the purpose of drying wool, woollen yarns, woollen cloths, and other articles; and other improvements connected with the use of the press in the process of dressing or finishing woollen cloths.—Sealed 13th September—6 months for inrolment.

To Thomas Wilkinson, of the Quadrant, Regent-street, ironmonger and engineer, for certain improvements in the construction of tram or railways, and in the carriages to be used thereon, being a communication from a foreigner residing abroad.—Sealed 13th September—6 months for inrolment.

To Thomas Swinburne, of South-square, Gray's-inn, Esq., for his invention of certain improvements in water-closets, and other conveniences of the kind.—Sealed 13th September—6 months for inrolment.

To Archibald M'Lellan, of the city of Glasgow, coach-builder, for his invention of certain improvements upon the springs and braces of wheel carriages, and upon the mode of hanging such carriages.—Sealed 13th September —6 months for inrolment.

To Frederick Le Mesurier, of New-street, St. Peter's Port, in the island of Guernsey, gentleman, for his invention of a certain improvement or certain improvements in the construction of pumps for raising water or other fluids. —Sealed 13th September—6 months for inrolment.

To Sir Hugh Pigot, of Foley-place, in the parish of Saint Marylebone, and county of Middlesex, Knt., for his invention of a certain engine or engines useful as steam engines, pumps, or propellers of vessels or machinery.—Sealed 13th September—6 months for inrolment.

To William Day, of Gate-street, in the parish of Saint Giles-in-the-Fields, in the county of Middlesex, lithographer, for his invention of an improved mode or method of applying and combining timber and other materials used in the construction of ships or vessels, masts, yards, beams, piers, bridges, and various other purposes.—Sealed 20th September—6 months for inrolment.

To James Nasmyth, of Patricroft, near Manchester, in the county of Lancaster, engineer, for his invention of certain improvements in machinery, tools, or apparatus for cutting or planing metals and other substances, and in securing or fastening the keys or cottars used in such machinery, and other machinery where keys or cottars are commonly applied.—Sealed 20th September—6 months for inrolment.

To Robert William Sievier, of Henrietta-street, Cavendish-square, in the county of Middlesex, gentleman, for his invention of certain improvements in rigger pulley bands for driving machinery, and ropes and lines for other purposes.—Sealed 20th September—6 months for inrolment.

To John Thomas Betts, of Smithfield-bars, in the city of London, rectifyer, for improvements in the manufacture of gin, which he intends to denominate "Betts' patent gin," or "Betts' patent stomachic gin," being a communication from a foreigner residing abroad.—Sealed 21st September—6 months for inrolment.

To James Walton, of Sowerby-bridge, in the parish of Halifax, in the county of York, cloth dresser and friezer, for his invention of certain improvements in machinery for making wire cards for carding cotton, wool, silk, tow, and other fibrous substances of the like nature.—Sealed 21st September—6 months for inrolment.

To Emile Alexis Fanquet Delarne, jun., late of Deville, near Rouen, in the kingdom of France, but now residing at Bacon's-hotel, Saint Paul's Church-yard, in the city of London, calico-printer, for certain improvements in printing and fixing red and other colours, in which red forms a constituent part, upon cotton, silk, woollen, and other fabrics.—Sealed 27th September—6 months for inrolment.

To John Hughes Rees, of Penymaes, near Llanelly, in the county of Carmarthen, Esq., for certain improvements in the machinery applicable to the raising of water, for propelling boats, carriages, and other machinery, being a communication from a foreigner residing abroad.—Sealed 27th September—6 months for inrolment.

To Edmond Henze, of Fenton's-hotel, St. James's-street, in the county of Middlesex, merchant, for improvements in the manufacture of dextrine.—Sealed 27th September—6 months for inrolment.

To John Joseph Charles Sheridan, of Ironmonger-lane, in the city of London, chemist, for his invention of an improvement in the manufacture of soap.—Sealed 27th September—6 months for inrolment.

CELESTIAL PHENOMENA, FOR OCTOBER, 1838.

D.	H.	M.	
1			Clock after the sun, 10m. 14s.
	—		☽ rises 5h. 4m. A.
	—		☽ passes mer. 10h. 25m. A.
	—		☽ sets 2h. 29m. M.
			Encke's Comet R. A. 2h. 27m. dec. 40. 12.
			Ditto pass. mer. 13h. 45m.
	1	30	♅ in conj. with the ☽ diff. of dec. 1. 35. N.
2	18	57	☿ in Perihelion.
	22		☽ in Perigee.
3			☽ eclipsed inv. at Greenwich.
	2	46	Ecliptic oppo. or ○ full moon.
	20	52	Vesta □ with the ☉
4	10	20	☿ greatest elong. 17. 54. W.
5			Clock after the sun, 11m. 29s.
	—		☽ rises 6h. 2m. A.
	—		☽ passes mer. 1h. 1m. M.
	—		☽ sets 8h. 40m. M.
			Encke's Comet R. A. 2h. 21m. dec. 42. 41.
			Ditto pass mer. 13h. 24m.
10			Clock after the sun, 12m. 53s.
	—		☽ rises 9h. 55m. A.
	—		☽ passes mer. 5h. 51m. M.
	—		☽ sets 2h. 48m. M.
			Encke's Comet R. A. 2h. 11m. dec. 46. 24.
			Ditto pass mer. 12h. 54m.
	10	25	☽ in □ or last quarter.
11	18	4	☿ in conj. with ♃ diff. of dec. 0. 58. N.
12	7	58	♂ in conj. with the ☽ diff. of dec. 2. 41. S.
13	2	58	☿ greatest hel. lat. N.
	3	49	♀ in conj. with ♃ diff. of dec. 0. 26. N.
15			Clock after the sun, 14m. 5s.
	—		☽ rises 2h. 51m. M.
	—		☽ passes mer. 9h. 41m. M.
	—		☽ sets 4h. 15m. A.
			Encke's Comet R. A. 1h. 52m. dec. 50. 59.
			Ditto pass mer. 12h. 16m.
16	—		Mer. R. A. 12h. 39m. dec. 2. 9. S.
	—		Venus R. A. 12h. 28m. dec. 1. 25. S.
	—		Mars R. A. 9h. 29m. dec. 16. 22. N.
	—		Vesta R. A. 6h. 55m. dec. 19. 36. N.
	—		Juno R. A. 17h. 53m. dec. 12. 37. S.
16			Pallas R. A. 10h. 43m. dec. 5. 31. S.
	—		Ceres R. A. 11h. 22m. dec. 12 34. N.
	—		Jupiter R. A. 12h. 17m. dec. 0. 41. S.
	—		Saturn R. A. 15h. 40m. dec. 17. 44. S.
	—		Georg. R. A. 22h. 43m. dec. 8. 57. S.
	—		Mercury passes mer. 23h. 3m.
	—		Venus passes mer. 22h. 51m.
	—		Mars passes mer. 19h. 49m.
	—		Jupiter passes mer. 22h. 36m.
	—		Saturn passes mer. 2h. 1m.
		44	♀ greatest hel. lat. N.
	10	6	♃ in conj. with the ☽ diff. of dec. 1. 17. N.
	18	6	♀ in conj. with the ☽ diff. of dec. 2. 6. N.
			☽ in Apogee.
17	2	19	☿ in conj. with the ☽ diff. of dec. 2. 54. N.
18	2	25	Ecliptic conj. or ● new moon.
20	22	14	♄ in conj. with the ☽ diff. of dec. 6. 15. N.
	—		Clock after the sun, 15m. 3s.
	—		☽ rises 8h. 48m. M.
	—		☽ passes mer. 1h. 4m. A.
	—		☽ sets 5h. 11m. A.
			Encke's Comet R. A. 1h. 19m. dec. 56. 35.
			Ditto passes mer. 11h. 23m.
25			Clock after the sun, 15m. 45s.
	—		☽ rises 2h. 4m. A.
	—		☽ passes mer. 5h. 23m. A.
	—		☽ sets 9h. 7m. A.
			Encke's Comet R. A. 0h. 12m. dec. 62. 44.
			Ditto passes mer. 9h. 59m.
26	8	58	☽ in □ or first quarter.
28	9	55	♅ in conj. with the ☽ diff. of dec. 1. 36. N.
29	17	54	♃'s first satt. will im.
30			Clock after the sun, 16m. 10s.
	—		☽ rises 3h. 35m. A.
	—		☽ passes mer. 9h. 52m. A.
	—		☽ sets 2h. 59m. M.
			Encke's Comet R. A. 22h. 2m. dec. 66. 4.
			Ditto passes mer. 7h. 33m.
31	8		☽ in Perigee.

J. LEWTHWAITE, Rotherhithe.

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CONJOINED SERIES.

No. LXXX.

Recent Patents.

To William Fourness, *of Leeds, in the county of York, painter, for his invention of a certain improvement or improvements in ventilating pits, shafts, mines, wells, ships' holds, or other confined places.*—[Sealed 16th November, 1837.]

The Patentee describes his invention in the following manner:—"My improvements in ventilating pits, shafts, mines, wells, ships' holds, or other confined places, consist in a peculiar construction of apparatus adapted to such purposes, and in the application of a rotary fan thereto, as an exhauster, to draw the foul air therefrom; and, in order to facilitate the following more particular description of my improvements, I have attached to these presents four sheets of drawings, and marked the same with figures and letters of reference.

"These drawings, illustrating the details of my improvements, are representations of the apparatus as peculiarly applicable to ventilating shafts and mines; but it will be obvious that a slight variation in the construction only, will be necessary to apply the same to wells, ships' holds, and other confined places.

"Plate IV., fig. 1, is an elevation of my improved apparatus; and fig. 2, a plan of the same; *k, k, k, k,* are two side plates enclosing an ordinary rotary fan, which is made to revolve by means of the speed pulleys *z, z, z*; around the fan are weather boards or shields A, A, A, to prevent any accidents, but can be removed if necessary; between these boards the fan delivers its air; B, B, two side pipes, which are bolted fast to the side plates *k, k, k, k,* and also to the foundation plate *m, m.* The dotted lines D, D, on the stone-work, show the wind road continued through the same to communicate with the cast-up pit C; *n, n,* is the ground line, or the surface of the earth.

"The apparatus in the drawing is represented out of motion; when required to be used, the door D, must be closed, and the two valves *a, a, a, a,* to be set open to any necessary extent, and kept open by the catches *y, y,* affixed to the side pipe; the pit C, having a communication with the whole of the shafts in the mine, or part of them, each shaft is an opening for the atmospheric air to 'cast down;' the vacuum formed by the revolutions of the fan, draws the air through the bottom workings or passages in the mine, sweeping all noxious gases, &c. away with it, and, by this means, rendering the mines, or any other place requiring ventilation, quite clear and wholesome.

"Should any accident happen to any part of the machinery, the ventilation would be stopped; in order to keep up the ventilation, the following method is pursued:—*b, b, b, b,* shows the extremity of a passage or cupola making a direct course from the cast-up shaft C, to the bottom of the engine chimney E; *f*, *f*, the passage from the pit to the inside of chimney; *g*, *g*, *g*, fig. 2, represents a steam pipe connected with the boiler of the engine, with holes pierced through it, and covering the surface of the pipe on that side next the chimney. Shut the valves at *a*, *a*, *a*, *a*, and open the door *d*, which leads into the upcast shaft C; the rarefaction caused by the boiler fire in the chimney, causes a current of air to be drawn to it. The steam pipe *g*, *g*, *g*, in the Plan, fig. 2, is represented by *e*, *e*, in the elevation; when the engine is standing, the steam in the boiler is useless, turn it into the pipe above described, and mixing with the gas coming in contact with the fire or flame in chimney E, it brings the gas below firing point, and prevents it from igniting; the steam at the same time causing a partial vacuum, facilitates the velocity of the air passing through the works of the mine, or any other place it may be applied to.

"Should there want new brasses, take out the cotter pin at *h*, slacken the nuts *i*, *i*, *i*, remove the headstocks sufficiently back to clear the coupling *h*; the speed pulleys can be then lifted off, and the brasses examined, without disturbing the fan or shaft.

"Figure 3, represents, at B, B, B, B, a fan entirely open at its outer diameter; A, A, A, A, the two side pipes which are the passages for air, the inlets or air passages through the plates *e*, *e*, *e*; *e*, *e*, *e*, are exactly the size of the fan in breadth, and of such dimensions in depth as to allow the throttle valve at *s*, *s*, to bed against it. The form and aperture of the inlet is shown in fig. 7, at *x*, *x*, *x*, *x*, as also the fan F, the dotted line *d*, *d*, shows the valve supposed to be situated in the inlet or supply pipe, and can be opened or shut, as necessity may require: *c*, *c*, *c*, *c*, represents the flange of side pipe, for the purpose of bolt-ing it to *e, e, e, e, e, e*. In fig. 3, *d, d*, the dotted lines show the wind roads through the stone-work *g, g, g, g*; C, the driving pulley.

"Fig. 4, K, K, shows the fan race; W, W, the wind road through the side pipes; X, X, the throttle or stop valve; S, S, the stone-work for the foundation.

"Figure 5, represents an horizontal fan F, F, F, F, open at its extreme diameter, same as figure 3; W, W, W, a round iron or other metal rim, with a passage through it the exact size of the fan, as a supply inlet or wind road, which forms a communication with the shaft or pit P, P; *r, r, r, r*, a ventilator fixed beneath the fan, to be of sufficient diameter to admit of any required quantity of air; G, the step or bearing for the axis of the fan to run upon. Fig. 6, L, L, represents the top side or plain view of the ventilator *r, r, r, r*, in fig. 5. The contingent power for keeping up the ventilation in cases of accident, in fig. 3, and fig. 5, the same as what is resorted to and described in figs. 1, and 2.

"This invention is also applicable for all purposes of exhausting air, gases, and caloric.

"An example is found on Plan 4: *u, u, u, u*, represents a furnace; R, R, a fan open all round its diameter; W, W, W, W, the exhausting pipes delivering into the fan R, R. Fig. 9, *t, t, t, t*, a stove for the purpose of drying cores, loom, &c.; *h, h, h, h*, an opening to the depth of the flue, to allow the heat to ascend into the stove *t, t, t, t*. The apertures in the sides of the furnace used for the purpose of turning in the blast in this plan is reversed, namely, the air is drawn down the furnace through the apertures along the flue, represented by darts, which is walled with fire bricks *b, b, b, b, b, b, b, b, b*, to the fan R, R, and then delivered into the atmosphere.

"By this method metals, especially iron, will be greatly improved in quality; the metal when in fusion will the more readily take up the carbon of the coke.

"The fire is lit on the top of the furnace, and drawn down on to the metal; the weight of the metal, &c. following down as the combustion advances, feeding the furnace at the top as usual. For the purpose of a blast, erect a covering or building of brick or other substance, over either figure 3, or figure 5, perfectly air-tight, bringing the air from the outside of the building beneath the floor, to connect with the side pipes A, A, in figure 3, or the inlet W, W, W, in figure 5, or the side pipes in figures 1, and 2; opening any unlimited number of openings in the sides of the said building, and attaching pipes thereto for the purpose of conveying air to the place required; by this means a superior blast may be got, far surpassing any now in use, and with less power.

"Having now described my improvements in ventilating, &c., and, as above stated, illustrated the same by showing its particular application to mines, I wish it to be understood that I claim, as my invention, the peculiar construction and application of the above described apparatus for the purposes of ventilation."—[*Inrolled in the Rolls Chapel Office, May,* 1838.]

Specification drawn by Messrs. Newton and Berry.

To JOSIAH PEARCE HOLEBROOK, *of Devonshire-place, Edgeware-road, gentleman, for his invention of an improved method or improved methods of propelling vessels.*—[Sealed 27th February, 1838.]

THIS improved method or improved methods of propelling vessels, consists or consist, firstly, of an improved paddle wheel, the paddles of which are not fixed radially, but move upon their centres: and secondly, of a paddle wheel, the paddles of which are fixed radially, as in the common paddle wheel, but which is, in other respects, greatly varied and improved.

And, first, of this improved paddle wheel, in which the paddles are not fixed radially, but move upon their centres.

Plate V., fig. 9, is a side view of a wheel constructed on this plan; and fig. 10, a sectional view, showing more clearly the essential parts of the wheel. The wheel consists of five principal parts, with their connexions and appendages; namely, an octagonal framework in two parallel pieces; the paddles between these frames; a guide wheel, to give the desired position to the paddles; a crank, to which the octagonal framework and guide wheel are connected in common; and what is called a star wheel, which transmits the power directly from the end of the paddle-wheel shaft to the outer circle of the paddle wheel: *a, a,* are the arms of the outer circle of the paddle wheel, terminating on the outer side in the octagonal framework, and on the inner, in a nave which turns loosely on a part of the crank before mentioned; *b, c, d,* is a bar which passes from one part of the octagonal framework to another, intersecting two of the arms *a, a,* between the points *b,* and *d*; *e, e,* are the arms of the guide wheel, which are connected on the inner side with the crank before mentioned, and project on the outer side a little beyond its octagonal frame.

The centre of the guide wheel is placed a little above the centre of the paddle wheel. The paddle wheel and the guide wheel are connected together by means of two metal straps moving upon four pivots, two of which are fixed in the guide wheel, at the points *f,* and *g,* and two at the points *h,* and *i,* of the bar *b, c, d.* The object of the bar *b, c, d,* being to obtain the two positions *h,* and *i,* for tw of the pivots of these straps, it is so placed in the paddle wheel, that if a circle were drawn from the centre of the paddle wheel, of the same size as a circle drawn from the centre of the guide wheel, passing through the points *f*, and *g*, of the guide wheel, and two radii drawn from the centre of the paddle wheel, intermediately between the radii of the paddle wheel, between which radii the parts *h*, and *i*, are placed, the points of intersection of the circle and these two radii would be *h*, and *i*. From the angles of the octagonal framings and the extremities of the arms of the paddle wheel, pass eight strong rods *p*, *p*, *p*, *p*, which brace together the inward and outward circles of the paddle wheel. The paddles *j*, *j*, with the stems fixed to them, are placed upon these rods, and connected with the guide wheel by means of the rods *k*, which are called guide rods; one end of which is attached, by means of pins, on which they turn, to the projecting ends of the arms *e*, of the guide wheel, and the other end works upon pins placed at the extremities of the stems of the paddles. Each paddle consists of a plate of iron, an iron half pipe with almost entirely closed ends, and three iron stems. A superficial view of one of these paddles complete, is given separately in fig. 13, and an end view in fig. 14. A superficial view of the half pipe is also given separately in fig. 15, and an end view in fig. 16. The half pipe, it will be observed, is placed by its edges against the iron plate, and upon this half pipe and plate are placed the three stems, the whole being firmly fastened together.

From the extremity *u*, of an arm of the guide wheel, a guide rod proceeds to a stem of the uppermost paddle, fig. 10; while from another extremity *v*, of another arm of the guide wheel, a guide rod proceeds to the stem of the lowermost paddle; both stems having holes in them for pins for the connexion of their respective guide rods. Any direction given to either of these guided stems will be mainly transmitted, by the half pipe, to the other stems and the other parts of the paddle; and, thus, any twisting of the paddle is scarcely possible of occurrence. It is not necessary to have three stems to a paddle, nor is it absolutely necessary to have the paddle constructed of iron, as I have supposed it to be; because it may be made of wood and iron in various ways; but the method I have described is one which I think to be at once useful and strong. From what I have stated, it will have been seen that the paddle wheel and the guide wheel are attached and made to revolve together, upon the principle of a well known method, namely, by means of straps or cranks; the distance between whose working points is equal to the amount of the eccentricity of motion of the paddle wheel and guide wheel, and whose same points are in a direction parallel to the direction of the centres of the paddle and guide wheels. Every paddle in the course of one revolution of the wheel, assumes in turn each of the positions which the different paddles exhibit in fig. 9, or other positions corresponding therewith.

In the sectional view, fig. 10, *n*, *o*, represents part of the paddle-wheel shaft; *a*, *a*, *a*, *a*, the arms of the paddle wheel connected together at their extremities by means of the rods *p*, *p*, *p*, *p*, upon which the paddles *j*, *j*, turn; the inward arms *a*, *a*, of the paddle wheel terminating inwards in a nave firmly fixed to the paddle-wheel shaft; and the outward arms *a*, *a*, of the paddle wheel terminating inwards in a nave which revolves loosely upon the lower part of the crank *l*, *m*. Hitherto, the only connexions I have shown between the outer and inner circles of the paddle wheel are the rods *p*, *p*, *p*, *p*; but in *q*, *r*, *s*, *t*, fig. 10, and shown separately in figs. 11, and 12, is represented the star wheel before mentioned, which I have introduced for the purpose of farther connecting the outer circle with the paddle-wheel shaft.

I call it a star wheel, because it resembles in form a wheel without a periphery or bounding lines. It is firmly attached by a nave to the extremity of the paddle-wheel shaft, and by the extremities of its arms (which are made of a bent shape for the purpose) to parts of the arms *a*, *a*, of the outer circle of the paddle wheel. By means of this star wheel, the outer circle of the paddle wheel is more directly moved by the paddle-wheel shaft, than by means of the rods *p*, *p*, *p*, *p*, upon which the paddles move. It should properly be stated in this place, of this star wheel, that the peculiar bent form given to it in fig. 10, is not its only form; because, according to circumstances, it may be bent differently, and may be superseded by a wheel with a rim; the arms of which wheel need not be bent, but the extremities of which arms may be attached by means of rods, connecting other formed framings of the paddle wheel, and this then modified apparatus together; but I would here observe, that the form which I have given to this apparatus in fig. 10, is that which I consider generally to be most desirable. It should be here noticed that this apparatus is not seen in fig. 9; because being placed behind the paddle wheel, and its arms coinciding in direction with parts of the arms of the paddle wheel shown in that figure, it could not be exhibited in such a view of the wheel as is given in that figure. In a paddle wheel such as is represented in figs. 9, and 10, the measure of the eccentricity of the combination is equal to about one half of the distance between the centre of the stem of a paddle and the point at which the stem is guided; but it is hardly necessary to observe, that this measure of eccentricity may be increased, and that, in proportion as it is increased, the paddles, which are at the bottom of the wheel, will assume positions more nearly vertical, and *vice versa.* The converse of this proposition must be equally evident; namely, that in proportion as the distance between the two before-named points of the stem of a paddle is diminished, the paddles will also assume positions more nearly vertical ones, and *vice versa.* From fig. 9, it will be perceived that the arms of the guide wheel, upon which the two lowest guide rods are placed, are equally distant from the lowest arm of the paddle wheel; and this will be found to constitute an important novelty in my plan of construction; for it is by this, or some like relative position of these two parts, that I am enabled to obtain such positions of the paddles as are shown in the figure. I have used a crank as a point upon which the guide wheel may revolve, and I have placed the guide wheel within the paddle wheel, but it is not absolutely necessary, either that the crank should be used, or the guide wheel so placed; because a guide wheel upon a large eccentric centre might be used, and the guide wheel might be placed outside of, and on either side of the paddle wheel, though not, in my judgment, to so much advantage.

My second improved method of propelling vessels consists of an improved paddle wheel, the paddles of which are fixed radially, as in the common paddle wheel, but in which the paddles are made to move from and towards the centre of the wheel, so that any degree of immersion of the paddles may be produced which may be deemed desirable, and the paddles may also be reefed occasionally. The method by which the paddles of a wheel may be made to recede from and approach towards the centre of a paddle wheel, is illustrated by figs. 17, to 22, inclusive. Nuts are fastened to the paddle boards, and screwed to fit long screws, extending from nearly the centre of the paddle wheel to the rim of the paddle wheel; and these screws work in sockets at their extremities and other parts; having, near those extremities near the centre of the paddle wheel, small toothed pinions, which pinions take into the teeth of a reel, having the teeth of a crown wheel at each end; this reel moving easily upon that part of the paddle-wheel shaft which is between the two circles of which the paddle wheel is composed: between the side of the vessel and the circle of the paddle wheel nearest the vessel is a crown wheel, also moving easily upon the paddle-wheel shaft; and between the crown wheel and that end of the reel before mentioned, which is nearest the vessel's side, there is a small toothed wheel, whose bearings are fixed to the inner circle of the paddle wheel, which takes both into the reel and the crown wheel, maintaining a connexion between both of these parts; while this small toothed wheel is so placed on the paddle wheel, that it does not take into the pinions of the screws of the paddles. In connexion with the crown wheel next the vessel's side is a clutching apparatus, to grasp at times the circumference of this wheel whenever the paddles are required to have their places changed, the operation of which clutch I shall hereafter describe. Fig. 17, represents a sectional side view of a paddle wheel, taken at that end of the reel before mentioned, which is nearest the vessel's side; or to make myself more clearly understood, of a section made by a plane in the direction of the dotted line *a*, *b*, of fig. 18. In fig. 17, let the parts *c*, represent the paddles in section; those marked *d*, nuts fastened to them; let the parts *e*, represent the screws passing through these nuts, playing by their outer extremities in sockets *f*, and at parts near their other extremities in other sockets *g*, and also in other sockets, by their other extremities *h*: upon squared parts of these screws, between these two sets of sockets last mentioned, are fixed small toothed pinions *i*: the part *j*, represents a section of the paddle-wheel shaft, Now, besides the parts of fig. 17, already described, there is still another part to notice, which is the small toothed wheel *k*, which maintains the connexion between the reel and the crown wheel before mentioned; this small toothed wheel is the same as is shown in another position in fig. 21, being marked also in that figure, *k*. Fig. 17, represents the interior side of the circle of the paddle wheel nearest the vessel's side; which circle exactly resembles the other circle in structure, except as regards the small toothed wheel *k*, which appertains to the inner circle exclusively, and except also the screws thereof, the screws of the two circles being threaded in opposite directions. Fig. 18, is an edge view of a paddle wheel of the construction I am now describing, showing the paddle-wheel shaft, the reel, the crown wheel, and the clutching apparatus in section, and the uppermost and lowermost paddles, with their screws and nuts in full view. In this figure, *j*, represents the paddle-wheel shaft; *l*, *l*, the before-mentioned reel; *m*, *m*, the crown wheel; and *n*, *n*, part of the clutching apparatus in section: the parts marked *f*, the outer sockets of the screws; those marked *g*, the other sockets; and those marked *h*, the innermost sockets of the screws *e*, *e*, *e*, *e*, of the uppermost and lowermost paddles: the parts marked *i*, represent the pinions fixed near the ends of the screws, and those marked *d*, the nuts fastened to the paddles through which the screws pass. The small toothed wheel *k*, of fig. 17, is not shown in this figure (fig. 18), in order to avoid confusion in the drawing. It should be specially noticed of fig. 18, that the screws of one wheel are differently threaded from those of the other, because the reel, by putting the opposite pinions into opposite action, would, unless this difference of threading was made, cause the nuts at one end of a paddle to advance towards, while the nuts at the other end of the same paddle would recede from the centre of the paddle wheel. Fig. 19, represents a longitudinal section of the reel before mentioned, and fig. 20, an end view of each end of the same reel. Fig. 21, represents the mode of connexion of the reel with the crown wheel before mentioned; and fig. 22, represents the crown wheel before mentioned, which is marked *m*, when clutched; and also represents the paddle-wheel shaft in section, which is marked *j*. The clutching apparatus, shown in fig. 22, consists of two pieces of iron *n*, *n*, playing on a strong pin *o*, at one end, while the other ends have two screwed holes to receive the screwed spindle *p*; which spindle, be it observed, is screwed half way with a right-handed thread, and the other half way with a left-handed thread, the object of these different threads being to make both parts of the clutch approach and depart equally from each other at the same time. This spindle works in two sockets marked *q*, and has a tapering squared end *r*, to receive a key, by which it may be turned. It should be observed, that as the parts of the clutching apparatus *n*, *n*, which are in contact with this spindle do not move exactly in a straight line, it will be necessary that the screwed holes in these parts should be somewhat larger than the screwed part of the spindle, in order that when these parts depart from the positions in which they are represented in fig. 22, neither the spindle nor these parts should be strained. When the clutching apparatus is in the position in which it is represented in fig. 22, the paddle-wheel shaft is not prevented from being in motion, because, as the crown wheel *m*, moves easily upon the paddle-wheel shaft *j*, the clutching of the crown wheel *m*, does not necessarily stop the paddle-wheel shaft *j*: now, if this shaft be in motion while *m*, is clutched, the paddles will be made to advance or recede, their motion depending upon the direction in which the paddle-wheel shaft is in motion.

In order to show the effect produced upon the paddles by the crown wheel *m*, being stopped, I shall, first, refer to fig. 21, and I shall suppose that the paddle wheel moves in the direction of the arrow against this figure. Now, as the paddle wheel moves round, it carries with it the small toothed wheel *k*; and as this wheel *k*, cannot move round with the paddle wheel against the teeth of the crown wheel *m*, without also turning on its centre; and as this wheel *k*, cannot turn round on its own centre, without also turning round the reel *l*, it follows, that the position of the reel upon the paddle-wheel shaft will always be changing, while the wheel *k*, is in motion on its own centre. The reel being thus set in motion, let us refer to fig. 18, to perceive the effect upon the paddles. The reel, taking into all the pinions of the screws, will, by its motion, turn the screws on one side, in one direction, and the screws on the other side, in another direction; and as these screws have their threads, some in one direction and some in a reverse direction, the effect upon these screws will be that parts of them will be continually evolving from and entering the different nuts; and as the screws are prevented by the combination from moving towards the centre of the paddle wheel, the nuts and, with them, the paddles will move towards the periphery of the wheel. Of course, if the paddle wheel revolves in a contrary direction, the results will be contrary. By what has been said, and supposing fig. 18, to represent part of a larboard wheel, it will be perceived, upon consideration, that if it were desirable to place the paddles nearer the periphery of a wheel, while a vessel was in motion, the only operation which would be necessary to be performed, would be to bring the clutch into operation; the motion of the engine would do all the rest. It would not even be necessary to firmly grasp the wheel *m*, but only to prevent it from going as fast as the paddle wheel; because a difference in speed of the wheel *m*, and the paddle wheel, would produce, only more slowly, the same effect that would be produced by totally arresting the progress of the wheel *m*, while the paddle wheel was in motion. By fig. 17, it appears that the paddles would not be reefed, but only moved from their places; but by the same means that the whole of a paddle is moved, a part of one could also be moved; and if a moveable part of a paddle were brought under cover of another fixed part, such a paddle would really be reefed. It follows, that the modification shown in fig. 17, in order to allow of its paddles being reefed, only requires to have permanently fixed paddles, and small moveable ones pushed out beyond the fixed ones; and then, upon moving the smaller ones, under cover of the fixed ones, the paddles of the wheel would, in reality, be reefed. It will have been perceived, from what has already been stated, that the paddles in figs. 17, and 18, do not travel upon the arms of the wheel, but merely upon the screws, while the screws are partly attached to the arms, and partly to the nave of the wheel; but there is nothing in this combination to prevent bolts from being fixed to the paddles, which bolts may slide upwards and downwards upon the arms of the paddle wheel; or the nuts of the paddles may be made of such a form, that they may do for bolts as well as nuts. In figs. 17, and 18, the screws are represented as turning round, while the nuts advance and retire: but this is not absolutely necessary, because the screws may be made to advance and retire, bringing and taking with them the paddles fastened to them, and the nuts of the combination may be made alone to revolve; for, suppose that the pinions *i*, were not firmly fastened to the screws, but screwed within, and made to act as nuts upon the parts of the screws within them; then, by the revolutions of pinions in different directions, the screwed threads within them would cause the screws to advance or retire. In the case of such a combination as this, it would not be necessary that the screws marked *e*, should be screwed through all their length, but only through such a part as would be necessary for their working through the distance, through which they could, under such circumstances, work. Until the clutching apparatus is brought into action, the paddles and their screws, and the reel, and the wheel *k*, and the wheel *m*, all revolve as the paddle wheel revolves; in fact, there is not the slightest action between any of the parts of which the paddle wheel is composed; but when the clutch is brought into operation, then only is there any motion among the parts of the paddle wheel. When the paddles are desired to be pressed more outwards towards the periphery of the wheel, all that is necessary to effect this purpose, is to bring into slight contact the wheel *m*, and the clutching irons *n*, *n*, and to keep this contact until the paddles arrive at the positions desired.

And having now fully described my said two improved paddle wheels, I declare that I do not claim as of my invention any of the parts of which the said wheels are respectively composed, as in themselves, and separately considered new; but that what I claim as of my invention, in respect of the first wheel hereinbefore described, is the general combination of known mechanical contrivances, by which the position of the paddles is varied, according to the revolution of the wheel, and, according to the degree of useful resistance required from them, in a more simple and efficient manner than by any other wheel, on the same principle heretofore in use; and, in respect of the second wheel, hereinbefore described, the general combination of known mechanical contrivances, by means of which the paddles, although fixed radially, may be immersed to any degree desired, and may also be occasionally reefed. And I claim, further, the application of the guide and star wheels, respectively modified, hereinbefore described, separately or conjointly, to any other of the known paddle wheels, on the feathering principle; and, also, the separate application of the contrivances or methods hereinbefore described, to differently immersing or to reefing the paddles of wheels when these paddles are radially fixed. —[*Inrolled in the Inrolment Office, August,* 1838.]

To William Neale Clay, *of West Bromwich, in the county of Stafford, manufacturing chemist, and* Joseph Denham Smith, *of St. Thomas's Hospital, in the borough of Southwark, student in chemistry for their invention of certain improvements in the manufacture of glass.*—[Sealed 16th November, 1837.]

This invention consists in the application of certain materials in the manufacture of glass, not heretofore so used, by which we are enabled to obtain various descriptions of glass of an excellent quality, and at a reduced cost; such materials being used with the matters now employed, or in substitution for some of the matters now used in the various mixtures for making glass, which is brought to market under various denominations, the names of such glass depending, in some respects, on the process through which it passes, and the uses to which it is applied; but all glass-making may shortly be stated to be the fusing of silica at a great heat, with certain saline or alkaline substances, and, in some cases, the oxides of lead at the same time. There are probably no two glass-makers engaged in making glass which is sold by the same name, who would agree as to the mixtures to be used; and, as far as our experience goes, we have not found any two makers, either of flint glass, crown glass, plate glass, or glass under other names, who employ the same quantities of ingredients; and, in some cases, different makers vary the materials from which the same named glass is manufactured.

We are, therefore, unable to set forth any general rule of glass-making for any of the various named glasses; at the same time, the materials which we apply to the purpose of improving the glass manufacture in general, will, with greater or less advantages, apply to the various mixtures used by different glass manufacturers. We, therefore, propose to give such mixtures of silex, and the materials ordinarily in use, with such quantities of the materials now to be newly applied, according to our invention, as will be suitable to the making of flint glass.

The various processes of glass-making being well known to glass-makers, no description will be required for performing the same, such processes constituting no part of our invention: nor are the processes of fusing of the mixtures, nor the subsequent treatment of the glass to produce the various named glasses, changed or altered. The invention relating to the application of certain materials not hitherto so used in combination with silex and other matters for making glass.

And our invention consists, first, in the application of combinations and salts of barium, strontium, and zinc; and, secondly, in the application of granitic, or other rocks abounding with felspar.

In using combinations, or salts of barium, or of strontium, we prefer the carbonates of barytes or strontia which are found native in some parts of this kingdom; or otherwise, for them to be in the state of sulphate of barytes; in which latter case we mix a proportion of charcoal, or other carbonaceous substances.

In using combinations or salts of zinc, we prefer the oxide of zinc which is formed during the process of manufacturing that metal.

Mixture for making glass by combining combinations, or salts of barium, with silex and other materials: Sand, 320 parts by weight; red lead, 150 parts by weight; carb. barytes, 145 parts by weight; carb. potash (pearl ash), 112 parts by weight; nitre, 7 parts by weight; some little oxide of manganese (the usual quantity).

Mixture for making glass by combining combinations, or salts of strontium, with silex and other materials: Sand, 320 parts by weight; red lead, 150 parts by weight; carb. strontia, 108 parts by weight; carb. potash (pearl ash), 112 parts by weight; nitre, 7 parts by weight; oxide of manganese as usual.

Mixture for making glass by combining compounds, or salts of zinc, with silex and other matters: Sand, 320 parts by weight; red lead, 150 parts by weight; oxide of zinc, 56 parts by weight; pearl ash, 112 parts by weight; nitre, 7 parts by weight; oxide of manganese, some little as usual. In some cases we do not use red lead (oxide of lead), but then we double the quantities of carb. barytes, carb. strontia, and oxide of zinc, respectively.

Other descriptions of glass we make with the following mixtures:

	Parts by weight.		Parts by weight.		Parts by weight.
Sand	480	Sand	480	Sand	480
Carb. barytes .	300	Carb. strontia .	224	Oxide zinc . .	120
Carb. soda (pure)	165	Carb. soda (pure)	165	Carb. soda (pure)	165
Little oxide of manganese.		Little oxide of manganese.		Little oxide of manganese.	

Further mixtures:

	Parts by weight.		Parts by weight.		Parts by weight.
Sand	280	Sand	960	Sand	960
Chalk	88	Chalk	200	Chalk	200
Sulph. soda	84	Sulph. soda	290	Sulph. soda	290
Sulph. barytes	90	Sulph. barytes	460	Sulph. strontia	370
Charcoal	8	Charcoal	40	Charcoal	40
Little manganese.		Little manganese.		Little manganese.	

These mixtures form cheaper glasses, as they enable the manufacturer to use less alkaline or saline substances than before.

We will proceed to give mixtures of the application of those rocks in which felspar predominates, and which, at the same time, contain very little or no oxide of iron; as, for instance, a mineral found in Cornwall, and used in the potteries under the name of "Cornish Stone;" this we use in conjunction with common salt or muriate of potash, and we find these mixtures to afford good and cheap glass.

	Parts by weight.		Parts by weight.
Cornish stone powdered fine as sand	100	Cornish stone powdered fine as sand	100
Common salt	12	Common salt	16
or		or	
Muriate of potash	16	Muriate of potash	22
Chalk	20	Chalk	16

Having thus described the nature of our invention, and the manner in which the same is to be performed, we would remark, that although we have given particular quantities of the various materials in the mixture, we do not confine ourselves thereto, and the glass manufacturer will readily adapt our invention to the object he desires: for, it will be seen that an important feature of our invention is, in some cases, to reduce the necessity of using so much red lead, and, in other cases, to dispense with the use of red lead altogether, and, in other cases, to reduce the extent of using alkaline or saline substances, by the application of other materials. Hence, supposing a glass-maker is about to apply any of the substances herein mentioned, as constituting our improvements in the manufacture of glass, and supposing him to have a particular mixture of his own, which, as before stated, is most generally the case, he will apply some one or more of the matters herein mentioned, for it is not necessary that only one of the matters should be employed in any particular mixture.

And we would have it understood that we lay no claim to the using of any of the other materials herein described, nor do we confine ourselves thereto, as there are other materials used in glass-making, for various purposes, and as is well understood. But what we claim, as the first part of our invention, is, the application of compounds, or salts of barium, strontium, and zinc, in combination with silica and other materials, in the manufacture of glass; and, secondly, we claim the application of granitic or other rocks in which felspar predominates, in the manufacture of glass.—[*Inrolled in the Inrolment Office, 16th May,* 1838.]

To RICHARD ROBERTS, *of Manchester, in the county of Lancaster, civil engineer, for his invention of a certain improvement, or certain improvements in steam engines, and also in the mechanism through which the elastic force of steam is made to give impulse, and to regulate the speed of locomotive carriages.*—[Sealed 13th April, 1832.]

THERE are six distinct features of invention embraced under this patent; first, a mode of varying the quantity of steam supplied to the working cylinder of a locomotive engine, by peculiar constructions of valves; second, the mechanism by which variable actions of these valves are effected; third, a mode of regulating the supply of water to the boiler; fourth, a contrivance for preventing either of the driven wheels rubbing upon the rail when the carriage is passing over curved lines; fifth, the adaptation of steam force to a break for retarding the progress of the carriage when required; and, sixth, a peculiar mode of constructing the running wheels.

We regret that the length of this specification, and the magnitude of its drawings, prevent us from giving it in detail; but we shall point out the manner in which these objects are to be carried into effect, and have no doubt but that they will be perfectly understood by our readers.

Instead of the ordinary slide valve for opening and closing the induction and eduction passages of the working cylinder, the Patentee employs a cylindrical or prismatic tube, working within a corresponding tube or box, and furnished with the necessary openings for allowing the steam to ingress and egress. The construction of this apparatus must be obvious to all acquainted with steam engines; but a second similar apparatus is connected with this, forming a similar sort of valve for the admission of the steam, but subject to a smaller action; so that though the first-mentioned slide valve acts as in the ordinary way, the quantity of steam admitted to the valve box will depend upon the extent of action or opening of the second valve, through which the supply of steam passes from the boiler.

The action of both these valves is derived much in the usual manner, by jointed rods or levers from some of the moving parts of the engine; but upon the lengths of some of these rods or levers will depend the extent of the action of the valves. It is, therefore, contrived that one of the rods or levers forming the connexion with the auxiliary valve, shall be capable of adjustment as to its length, thereby making the stroke, and, consequently, the sliding action of the valve greater or less, as may be required. This adjustment may be made by the man attending the engine, or it may be connected to a governor, and by that means made self-adjusting, and thereby to determine the speed of the engine.

The mode of regulating the supply of water to the boiler is by a receiving vessel placed on the side of the boiler, into which the water from the boiler flows freely. A hollow ball float is placed within this vessel, connected by a perpendicular rod and levers to the cock in the water pipe leading to the boiler. When the surface of the water in the boiler, and, consequently in the said receiving vessel, is at the height required, the elevated situation of the float will cause the cock to be closed; but when the surface of the water sinks below the required level, the float will descend and open the cock, so that the water may be allowed to flow into the boiler.

In order to allow of the two running wheels to which the driving power is communicated, to revolve with different speeds, or what is termed differential motions, when passing over curved lines of rails, the shaft, upon the ends of which the running wheels are fixed, is made in two parts connected by a cylindrical socket. Upon each of these shafts a pulley or a chain wheel is affixed, and driven by a strap or a chain from a corresponding pulley or wheel on the crank axle of the engine. These pulleys or chain wheels are each attached to the back of a bevel wheel, and turn with those wheels loosely upon the crank shaft; but these wheels are locked thereto by a mitre wheel, which takes into both. This mitre wheel is mounted upon a stud, which stands out at a right angle from the crank shaft, and is consequently carried round by the crank shaft, and thereby made to give rotary motion to the lower bevel wheels, and through the agency of the pulley, straps, or chains, to the shafts of the running wheels also. Now, as long as the direction of the carriage continues in a right line, the two running wheels will be driven with equal rotary motions; but when the carriage passes along curves in the line of road, the inclination of the carriage to the right or left, will cause that wheel which runs upon the smaller *radius* of the rails to be partially retarded by an increase of friction; and this retardation being communicated through the strap or chain to its driving pulley and bevel wheel, that bevel wheel will give a small quantity of retrograde motion upon its axle to the connecting mitre wheel, and thereby cause the other bevel wheel to be moved onward, and, by that means, increase the rotary motion of the running wheel upon the outer or larger *radius* of the curve.

The mode of retarding or dragging the running wheels when passing down inclined planes, is by means of an ordinary break, the lever of which is acted upon by the power of a piston in an auxiliary steam cylinder.

The novel construction of the running wheels, which constitutes the sixth feature of the invention, consists in forming transverse grooves in the box of the wheel, into which the inner ends of the spokes are to be inserted, and they are made fast by end discs or cups. The outer ends of the spokes are formed with crutch heads fastened to the felloes, which are made of angle iron bent into the circular shape, and the outer part is a circle of iron put on when hot and shrunk fast upon the felloes, which makes all tight. —[*Inrolled in the Inrolment Office, October*, 1832.]

To William Elliott, *of Birmingham, in the county of Warwick, button-manufacturer, for his invention of improvements in the manufacture of covered buttons.*—[Sealed 14th December, 1837.]

This invention consists, simply, in covering a button with a piece of woven fabric, having a raised figure or ornamental device, which shall occupy the centre of the face of the button when finished. The description of buttons to which this invention is intended to apply, are those made with flexible shanks, by covering a disc of metal or other material with a woven fabric, as cloth or florentine: the union of the materials being effected by pressure in dies, of which modes of manufacturing buttons we have given several examples in our preceding volumes, under the patents of Sanders, Ainsworth, Ashton, and others.

Trifling as this invention (if it can be called an invention) may appear, the specification is spun out to a most immoderate length, by verbose repetition and irrelevant description. We shall not, however, inflict upon our readers the task of wading through such an uninteresting mass, but merely mention the points to which the Patentee has thought it necessary to allude.

The Patentee refers to the weaving of fancy figures or devices in silk, in imitation of embroidery, and to raised figures in velvet, the process of producing which, however, forms no part of the invention, and are well understood. "My invention," he says, "only relating to the application of certain fabrics, having a set figure or design for the centre of each button."

Here, indeed, is the whole invention; and all which remains to be said is, that the fabric may be woven in squares to facilitate the stamping out of the figures accurately, so that the device shall be in the centre; and in order to place the piece so cut out accurately in the dies, a sliding point in the centre of the die, as a register pin, may be employed, or it may be done in any other way; and where the raised device is of velvet, the centre of the face die may be hollowed out, in order to avoid crushing the pile of the fabric.—[*Inrolled in the Inrolment Office, June,* 1838.]

To GEORGE RYDER PEPPERCORNE, *of Vauxhall, in the parish of Lambeth, and county of Surrey, gentleman, for his invention of an improved machinery, to be employed for locomotion on railroads and other roads, which is also applicable to other engines for exerting power.*—[Sealed 31st January, 1838.]

THE principle of this invention consists in converting the external or indirect motion, which takes place in the ordinary draught of carriages by quadrupeds, into a more direct or primary action, by which the animal is enabled to exert his power with more economy, greater safety, and at much higher velocities. It is well known that in ordinary draught, a great part of the horse's muscular action is exerted to carry his own weight, and above a certain velocity: any momentum obtained by the carriage at this point, not being continued to or partaken of by the horse, soon ceases, and the animal is constrained to exert his power at a lower velocity, by which one part of his muscular force is consumed in carrying his own weight, and the other that of dragging the weight of the carriage.

My invention consists, therefore, in the application of a certain combination of machinery to effect the raising and suspending, or supporting quadrupeds fit for locomotion, on a carriage or framework supported on wheels, by which the whole or great part of the weight of the horse is cartied by the interposition of certain springs, burs, girths, and braces. This framework being connected to the carriage for conveyance, whatever momentum may be obtained is combined of the weight of the horse, as well as of the conjoint carriage, and will follow the law of accelerated motion; the naturally interrupted action of draught is converted into a motion, which being transmitted continuously and directly to the carriage, constitutes it a primary machine for locomotion.

The action which takes place is, perhaps, better described by saying, that in ordinary draught the power of the horse is incapable of accumulation; whereas, the object of the present invention is to store up the average expenditure of force by the horse, at constant additions to the ultimate momentum.

Plate V., fig. 1, shows a side view or elevation of the conjoint carriage; and fig. 2, the ground plan, viz. the carriage of the horse A, and that for conveyance B, (which in this plan has the form of a phaeton,) connected together at C, by a vertical hinge or joint; *a*, *a*, *a*, is the axle passing over the back of the horse, and screwed or stepped into two blocks *b*, *b*, which are firmly coupled to the under shafts *h*, *h*, at *c*, *c*; this axle slides freely into a bent part of the axle arms *c*, *c*. It will be seen by the front view, fig. 3, that these axle arms are quite independent of the axle *a*, *a*, *a*. The shafts or frame *h*, *h*, is borne by two springs *d*, *d*, firmly coupled in the bed of the axle arms at *d*, *d*; *e*, *e*, is the suspension spring bar, sliding freely on *a*, *a*; *f*, *f*, the springs to be of wood or metal, connected by a cord, chain, leather, brace, or metal rods to *g*, *g*, the saddle bar, which also, as *e*, *e*, slides freely on *a*, *a*. This saddle bar is thus formed; the parts *k*, *k*, are truly turned to fit corresponding sockets bored in the arms *g*, *g*, in which they would revolve freely, but are stopped by two studs *m, m*, which fit two cuts or slots in *g, g*, which is shown more plainly in fig. 4, which is a section of *g, g*, the cut or slot being one quarter of the circumference, or any other less part, as one sixth of a circle. It will be seen hereafter, that this cut is to allow the horse connected by the saddle *n, n*, to *k, k, k*, to depress his hind quarters or haunches, for the purpose of backing the carriage, he is stopped forwards by the stud *m, m*; *n, n*, the saddle, a side view of which is shown at fig. 5, is connected to the saddle bar at *n, n*, by pins passing through two tenons in the saddle tree, which is iron, fitting corresponding sockets in *k, k*.

In fig. 1, *p, p*, are one, two, or more bent supports betweeen *h*, and *a*. I call them the upper shafts, although when made of elastic wood they answer the purpose of springs acting upwards: in the latter case, I prefer to make them in two or more slips, in the manner of the plates of metal springs; the one sliding on the other through brackets or couplings fixed to one or the other slip: *q, q*, is a bar, at the two ends of which is fixed the leather brace, passing over the axle *a, a*, which carries at the other end the spring bar *e, e*; round the centre of this bar *q, q*, is passed a leather brace, which is fixed to some central part of the upper shafts, and being continued to the winch *t, t*, is wound upon its axis or roller, and acted on by the lever, as shown in fig. 1.

I have described the leverage which I employ; but it is evident that other leverage may be employed, the object being to raise the horse by the spring bar *e, e*; in some cases the spring bar *e, e*, and springs *f, f*, may be dispensed with, the bar *q, q*, being made the spring, and connected directly to the saddle bar. Connected to *p, p*, by a bolt at *r*, are two cheek plates of iron, which carry the axis of the winch, and form one half of the vertical hinge connecting the carriages; the connecting bolt of this hinge is an upright rod c, furnished at the top with a transverse rod, to which reins may be attached; at the other end, and under the carriage, it carries a wheel, and round which is passed a rope or chain, in the manner shown in the ground plan, and fixed at *v*, *v*; the object of this leverage is to guide or turn the conjoint carriage. It is evident that there are other modes of effecting this, but I prefer the above described; w, is a cross piece, removed by withdrawing the pins for the admission of the horse. I here observe, that I do not restrict myself to any particular method of turning the carriage, but the above described method is the one I prefer; but the bent supports *p*, *p*, may be fixed to the carriage for conveyance and traverse, on the top of the upper axle *a*, *a*, *a*, *a*, as is usual with four-wheeled carriages. There is, also, another method I employ for this purpose, in connexion with the vertical joint at c; this plan is shown by Plan 4, in which A, A, is what I call a double traversing perch, which bears upon the centres of either pair of axles; the two ends of this perch are not fixed, but allow either axle to traverse to the extent of two slots cut through the perch, in the manner shown by the dotted lines; the connecting bolts which traverse the slots being fixed to the axles. A bar B, B, which is shown in section at fig. 8, is fixed athwart the perch, and on the under side is an iron bar, which allows the top of the connecting bolt of the hinge or joint c, to traverse thereon.

When the carriage is turned, it will be in the way shown by the dotted lines, the hinge or joint c, traversing to B, and the axles toward each other by the slots in the perch. I claim the application of this perch generally to carriages. I have called the axle *a*, *a*, *a*, *a*, *a*, the *upper* axle, because in fig. 1, the dotted lines under the axle *a*, *a*, *a*, show the application of an *under* axle, which I claim to employ in certain cases where great strength is required, or more than one horse is driven abreast. The application is also shown in fig. 3; in this case the bent axle arm *c*, *c*, is formed in the same way below as it is above the centres of the wheels, but it carries neither springs nor shafts. The under axle slides through a hole, as in the upper part, and is prevented coming out by the blocks, through which are fixed transversely four pins, and attached to these pins are chains or slight rods, the direction of which is shown by the dotted line carried on each side of the shafts *h*, *h*, up to *e*, *e*, the spring bar. When this latter is lowered, it lets fall the under axle to the ground, and allows the ingress or egress of the horse: when raised, it carries with it the under axle out of the way of the horses' feet, and clear of the ground. It is evident from the plans, that all that is required to adapt this conjoint carriage as a locomotive for railways, is to provide suitable wheels, which need no particular description: it is also evident that the joint or hinges is not indispensable for railways.

The next feature of my invention is a brake (or skid), which is shown in figs. 1, and 2, to be acted on by the driver without removing from his seat: *x*, *x*, are two springs of wood or metal, fixed across the axle or the bottom of the carriage; they are connected at *y*, by a bar or rod, which carries two other rods hanging freely *y*, *z*, to within about twelve inches of the ground; these vertical rods are again connected together by a bar which forms the axle of the brake to small wheels *z*, which may be formed of wood with an iron tire of some substance; and I prefer that their circumference should be cut away, as shown, to correspond with the periphery of the carriage wheel: from the axle of these small wheels a cord or chain is carried, as shown, round a loose pulley or sheave on the main axle, or fixed to some part of the carriage near the axle; the cord is continued upward, and acted on by a small winch, as shown, in the seat of the driver: the axis of this winch passes through the seat, and acts in like manner on the other side. By acting on the winch, the cord first draws the small wheels or skid close to the periphery of the carriage wheels; and if greater friction is required, by tightening the cord, the centrifugal action of the main wheel will draw the brake by bending the springs *x*, *x*, between the periphery of the large wheel and the roadway. The action of the springs is confined to a certain distance, by a chain fixed to the body of the carriage.

I claim the application of this brake to all wheel carriages. In some cases the springs *x*, *x*, may be replaced by two levers turning on the main axle; in this case the brake must be raised and lowered; the springs save one of these motions.

I do not claim the particular leverage herein described, but the particular mode of applying the small wheels *z*, *z*. Another feature of my invention of this mode of applying horse power is shown in fig. 6, to illustrate the manner in which the horse power is employed for fixed engine purposes. As the means of suspension, &c. have been previously described, it will be sufficient to state, that I convert the upward and downward, or alternate rise and fall which the springs give to the horse, into a rotary motion, by connecting the saddle bar to a crank movement. There is a peculiarity in the crank which I claim as my invention, and which I sometimes employ: the lever *d*, *d*, which, with the axle *c*, forms the crank, is not fixed thereto, but slides freely in either of two modes, viz. by a hole bored at right angles through the axis of the fly wheel, or by a slot in the lever *d*, *d*, itself, and which allows the axis *c*, to traverse it, grooves being cut in *c*, for that purpose: the plan shows either way in the same figure.

I call this a centrifugal crank, because the length of its leverage varies with and accommodates to the work to be done, or the quantity of power employed, which is particularly needful in the above mode of employing horse power, as the horses' paces are necessarily irregular. I remark here, that I employ a moveable platform to induce the horses' motion, which having been heretofore used, I do not describe.

I should observe, that in Plan 1, the upper shafts *p*, *p*, are fastened to the upper axle *a*, *a*, *a*, *a*, by a leather brace, which is passed under and over the axle, and continued all the way down the shafts or springs *p*, *p*. I have also omitted to describe two C springs introduced in the plan, which are not indispensable, but when used, are to support the above upper shafts *p*, *p*, and add to their elasticity; the bending of the latter is allowed for by slots on the cheek plates of the winch at *r*.

When two horses are to be driven abreast, no alteration need be made in the arrangements; they may be raised simultaneously or separately, but I prefer, nevertheless, to support the centre of the axle *a*, *a*, by another upright resting on an additional shaft or pole, to pass between the two horses. In some cases I employ one or more horses in front, connected to the wheel horses in the usual way, by traces and a splinter bar: this does not, of course, apply to railways, where each horse must be supported, in order that he may be carried with the same velocity as the carriage. Should it, however, be desirable to have a horse, or horses in front, I continue the upper shafts beyond the axle bar *a*, *a*, by which it is supported to a convenient distance for suspending the front horse by an iron frame similar to the bent or cranked axle *a*, *a*, of the wheel horse, but connected to the upper shaft by a central bolt, which llows it to traverse freely round; the lower ends are to be connected by traces to a splinter bar in the usual way, the front horse being furnished with the same description of saddle as the wheeler, connected and suspended in the same manner.

I have thus described, to the best of my knowledge, the manner in which my invention is constructed; but it is evident that there are certain parts which may be varied under different circumstances; but I claim, as my invention, the raising and supporting, &c. all quadrupeds upon the carriage, as described, with a view to their exerting their power to greater advantage than by ordinary draught when unsupported.

I claim the application of this principle to all carriages, whether pleasure, agricultural, or industrial, and those used for military purposes, as well as artillery or gun carriages, and such carriages has have been used as sleighs, by the medium of runners in lieu of wheels in certain cases, the same combination for suspending or supporting the horse being used, viz. first, the combination of upper or upper and under axle, axle arms with the shafts, the leverage of whatever kind for raising or lowering the horse, the bars, saddle, &c.; second, the double traversing perch; third, the brake; fourth, the centrifugal crank and its application to the above combination, as well as for general purposes; and I do not, in all cases, use all the parts of this machinery, but what is sufficient of them, with lightness and strength, to produce sufficient leverage to raise and sustain any quadruped, with a view to locomotion in the manner set forth.—[*Inrolled in the Rolls Chapel Office, July,* 1838.]

Specification drawn by Messrs. Newton and Berry.

To CHARLES FITTON, *woollen manufacturer, and* GEORGE COLLIER, *mechanic, both of Cumberworth Hall, near Wakefield, in the county of York, for their invention of improvements in power looms.*—[Sealed 11th January, 1838.]

THIS invention of improvements in power looms is divided into five distinct heads, which are thus described by the Patentees:—First, a mode of beating up the weft by the application of excentrics, or cams, in place of the cranks heretofore employed; secondly, attaching the batten or lay to a carriage or frame, in place of using a swinging motion as heretofore practised; thirdly, a mode of suspending the treadles, whereby the warp threads are not so much worn as heretofore; fourthly, a mode of relieving the prominences or projections in the shuttle boxes, in order to the shuttle being thrown across without exerting so much force as heretofore, and, at the same time, avoiding the injurious effects heretofore consequent on the application of somewhat similar apparatus for like purposes; and, fifthly, a mode of regulating the weight on the warp beam.

Plate V., fig. 23, represents a transverse section of the loom, showing the positions and the operations of the parts constituting the three first heads of the invention.

The construction of looms being well understood, the Patentees consider that it will only be necessary to explain the variations consequent on applying the several novel parts, in order to work a loom according to their improvements; and, as such parts are shown in connexion with the ordinary parts of looms, a workman will not only readily trace the new arrangements, but will see their relative positions and mode of working in respect to the other parts of looms.

The first head of the invention relates to applying the cams *a*, and *b*, for the purpose of beating up the lay or bottom, and for taking the batten or lay back again. The object of applying cams in place of the cranks heretofore used, is to obtain a beating up of the weft, more resembling, in effect, hand-weaving, than can be accomplished by using of cranks; for it is evident that when cranks are used, the lay, as it approaches the weft and beats it up, is travelling at a decreasing speed, and finishes the act of beating up at a time when the crank is in its worst position, and at its lowest speed.

Now, it is known that the weaver, in working with a hand loom, gives a sharp stroke at the moment of beating up, and it will be evident that, when using cams or excentrics, the beating up may be effected with a degree of sharpness, according to the cut of the cams. This may be regulated even with the same cams, to different degrees of sharpness, by having the parts of the frame hereafter described, against which the cams work, capable of being set more or less vertically.

The cams *a*, *b*, are affixed on the main axis *c*, of the loom, and in place of the batten or shuttle board being suspended or swinging on swords, as is the most usual practice, we prefer the batten to be affixed to a carriage *d*, *d*, (which constitutes the second head of the invention), having adjusting plates *e*, and *f*, for the cams *a*, and *b*, respectively to act against, and by which means the carriage *d*, *d*, is forced to and fro.

The carriage *d*, *d*, slides or moves to and fro on the guide pulleys *g*, *g*, which may be provided with means of adjustment whereby to enable the direction of the blow to be varied, and in place of having a horizontal movement, it may strike at an angle similar to that when the batten swings.

Although we prefer the batten to be affixed on the carriage *d*, it is evident that the cams *a*, and *b*, may be used, and the batten or lay suspended, or swing to and fro on swords as heretofore, having only so much of the frame of the carriage *d*, as will enable the cams or excentrics *a*, *b*, to perform their parts.

The third head of the invention is the treadles *h*, *h*, which respectively move on an axis *i*, carried by the sliding plate *k*, which plate is capable of moving up and down on guide rods; hence the treadles can be thrown off or out of the way of their cams or excentrics. By this means only so much of the warp as is required for opening the shed will be moved, and hence the warp threads will not be so much worn as when the whole of the warp is moved up and down. The figure shows the nature of the cams, the loom being harnessed for weaving four-leaved twill. A perpendicular rod *b*, is attached to the plate *k*, and also to the lever *m*, the latter having a rod *n*, connected thereto by a joint, and at the end of the last mentioned rod there is a treadle or stirrup, by which the workman, when he wants to raise the plate *k*, presses the lever down, it being held in its proper position by a spring catch.

It will hence be evident that in case any of the threads of the warp break, and it becomes necessary to get the warp threads in one plane or nearly so, the workman, by sliding up the plate *k*, will remove the treadles away from the cams, and when the warp has been pieced up, the plate may be restored to its position again.

Fourth head:—In most power looms there are used what are called swells, or projections, or prominences, which are connected with suitable apparatus for throwing the loom out of work, in case the shuttle does not enter correctly into the shuttle box at the end of the race or shuttle board; but in using that apparatus, the shuttle, at the time of picking, has to be driven out of the box with a force sufficient not only to throw the shuttle across the loom, but further, to overcome the pressure of the springs and apparatus of the swells or prominences on the opposite side, which is prejudicial.

Some attempts have been made to withdraw the swells or prominences, at the moment previous to picking, but without complete success; for the apparatus so employed is such, that, in the working of the loom, it is liable to trap the shuttle, by throwing the bent levers beneath the shuttle box over their tops, when the loom is required for any purpose to be turned back, or in an opposite direction to the ordinary movement of the main shaft: or else, the bent levers have been so arranged in respect to the instruments which lift them in order to relieve or remove the swell or prominence, that the levers can pass beyond, and, in moving forward, strike against the instrument, and discharge the parts.

According to our invention, the instruments used for lifting the bent levers are plates partly inclined, shown in the partial end view, fig. 24, so that the levers of the batten or lay do not pass off the plates or lifting surfaces, and in coming forward, the levers are supported by the plates for a greater length of time, and allow of the picking being better performed.

The levers of the swells or prominences are shown at *o*, in the shuttle boxes, and *p*, their springs, as heretofore; *q*, is a lever at one end of the loom, mounted upon an axis fixed in the framework or standard. This lever is acted upon by a tappet *r*, upon the main shaft, which, as it revolves, acts upon the lever *q*, and lifts the plates *s*, at the end of the lever at the moment just before the picking takes place, when the shuttle may be driven across without impediment of the swell or stop in the box from which it is drawn.

By using a length of plate *s*, the back surfaces being slightly inclined downward for about two-thirds of its length, the batten or lay, on going back, will not cause the lever *q*, to pass off the plate, and in place of being suddenly acted upon by the instruments as heretofore used, the lever is gradually acted upon by the plate, and in no case throws the levers over the ordinary stop *t*; consequently the shuttle cannot be driven against the warp threads, and hence, by not passing off the instrument or plate *s*, the levers cannot come suddenly against such instrument and derange the loom.

The fifth head of the invention relates to a mode of regulating the pressure of the tension cords passed round the warp beam, for it will readily be understood, that as the warp threads are drawn off the warp beam, its diameter will gradually decrease, consequently the threads are resisted with a different leverage.

Now, in order to accommodate such difference of leverage, we so arrange apparatus shown in the partial back view, fig. 25, that the suspended weights upon the tension lever may be gradually moved, in order to compensate for such varying of the leverage. The weight *v*, is capable of sliding along the lever *u*, and according to the distance it is from the fulcrum, so will be its effect upon the lever *u*: hence, supposing the weight to be at its furthest distance from the fulcrum, the friction cord or band *w*, will be exerting its greatest force; but if suitable arrangement of apparatus be worked from any part of the loom to draw the weight *v*, slowly towards the fulcrum, the force of the weight will progressively decrease. To effect this object, we attach to the weight *v*, a cord *x*, the other end of which is affixed to a drum or pulley *y*, on to which it can be wound, by a train of wheels connected to the end of the axle of the warp beam, as shown in the figure. The effect of this is, that as the warp on the beam decreases in bulk or diameter the weight will be slidden towards the fulcrum, and the tension reduced to any degree that may be required, and thereby a greater uniformity of tension given to the warp yarns than heretofore.

Having thus described the nature of our invention, and the manner of combining and applying the various parts, we would have it understood that we lay no claim to any of the parts of a loom separately, and some of the parts may be in some degree varied, but we believe the arrangement shown to be the best for that purpose. And it will be evident that either of our five improvements may be used separately, without the necessity of using all of them in the same loom, which latter is what we prefer.

But what we claim as our invention is, first, the mode of beating up the weft by the application of cams or excentrics, as herein described; secondly, the mode of working the batten or lay by a carriage in place of swords; thirdly, the mode of suspending the treadles, as herein described; fourthly, the mode of relieving the shuttle from the swells or prominences, as described; and fifthly, the mode of regulating the effect of the weights, as herein described.—[*Inrolled in the Inrolment Office, July,* 1838.]

To JAMES LOWE, *of King-street, Old Kent-road, in the county of Surrey, mechanic, for his invention of improvements in propelling vessels.*—[Sealed 24th March, 1837.]

THIS invention consists in a mode of propelling vessels by means of one or more curved blades set or fixed on a revolving shaft below the water line of the vessel, and running from stem to stern of the vessel.

Plate VI., fig. 6, represents so much of the stern of a vessel, having my apparatus applied thereto for propelling, as will enable me to explain the nature of my invention: *a*, being the shaft or axis on which the curved blades are set or affixed, this shaft or axis is to receive rotatory motion from a steam engine or other suitable power; *b*, *b*, are four curved blades, each a portion of a curve, which, if continued, would produce a screw; but here I would remark, that screws have been heretofore attempted to be used, and have failed of success, which has been owing to the water not being able to pass away, but that may be said to produce a choking action; and my intention is such, that there being only sections or portions of a screw employed, each blade is a propelling instrument, which allows the water to pass away in all directions, except at that point where the instrument is in full action: hence there is no choking or holding the water towards the centre of motion, which is the case in using complete screws.

Fig. 7, shows a portion of the shaft or axis, having only one blade or section of a screw, and fig. 8, shows an arrangement of two blades, one placed in the same line with the other; but I should state, that although this is an important improvement over the use of the complete screw, yet so far as my experience has gone, I have not found such an arrangement so good as the using each section of a screw or blade out of the line of all other blades, as is shown in fig. 6. The blades, it will be seen, are at the stern of the vessel, and the shaft on a line parallel with the keel, and the shaft, in passing through the vessel below the water line, is through a stuffing box in order to render the same water-tight.

It should be stated, that although I prefer to have the shaft above the keel, and in a parallel line with it, and the propellers at the stern of the vessel, I do not confine myself thereto, as a shaft or shafts below the water line having similar propellers, may be used at other parts of the vessel, such as at the sides or at the dead wood; but I believe that such arrangements are not so convenient as those shown by the drawing. And it should be stated, that I am aware that propellers, having somewhat similar action, were some years ago experimented on, and for which invention a patent was taken by Edward Shorter, such propellers being carried by certain outriggers over the bow of the vessel, as is shown and described in the specification of his patent, but the same failed. I do not, therefore, claim the application of curved blades generally, but my invention relates to the modes herein described of propelling vessels by applying one or more curved blades on shafts or axis below the water line of such vessels.—[*Inrolled in the Inrolment Office, September,* 1837.]

To JAMES BUCKINGHAM, *of Great Randolph-street, Camden-town, in the county of Middlesex, civil engineer, for his invention of certain improved combinations of machinery to be applied as mechanical agents in a great variety of situations, in which toothed gear and other mechanism have been heretofore employed.*—[Sealed 17th June, 1837.]

THIS invention consists, in the first place, in an improved arrangement of levers, to be acted upon by a rotary crank or cranks, whereby certain movements are obtained, which are peculiarly applicable, when in combination with other apparatus, to the raising of water from wells, mines, and other low situations, or with other suitable apparatus to raising loads or weights.

The arrangement of mechanism employed to effect the first mentioned object, is shown in Plate VI., at figs. 1, and 2, connected with a system of ascending and descending buckets, and other machinery, which forms the subject of a patent granted in England to Jacob Filton Slade, and dated the 11th day of January, 1836, in which patent right I am interested.

Fig. 1, represents a side elevation of my improved arrangement of two pairs of levers in connexion with a double crank, the shaft of which crank is mounted in suitable standards, and the fulcrum axle on which the levers turn, is also mounted in the same standards: fig. 2, is a front elevation of the same; *a*, *a*, are the standards or framework, supporting this part of the machinery; *b*, *b*, is the crank, the ends of its shaft turning in the standards —this crank shaft may be driven by a winch, by a band or pulley, or by toothed gear; *c*, *c*, is an upper shaft, also supported by the standards, which shaft forms the fulcrum or axle of the levers *d*, *d*. To any part of these levers, rods *e*, *e*, may be attached, as shown; and the reverse ends of these rods being connected to the cranks *b*, *b*, the rotation of the cranks will actuate the rods and levers, giving a reciprocating ascending and descending action to the levers. If, therefore, the buckets below be connected by rods, chains, or ropes, to the levers *d*, *d*, they will be raised and depressed alternately as the levers move up and down, which will effect the object desired, viz. raising and depressing, or working the buckets by a reciprocating action, for the purposes described in Slade's specification.

It is obvious, that this adaptation of levers and rods to cranks, for raising weights by reciprocating action, admits of some variations, viz. by placing the crank shaft above the shaft of the levers, or by the side of the lever shaft, observing, however, that the two shafts must be exactly parallel to each other. And a further variation may be made by employing double sets of levers; that is, two levers *d*, *d*, may be connected to each crank *b*, by means of rods *e*, *e*, as shown in figs. 3, and 4, that the chains, rods, or ropes for working the buckets (or raising any other weights by a reciprocating action), may, according to the lifting power required, be connected to any part of the levers between their fulcrums and extremities, and that the said chains, rods, or ropes for lifting may be attached to one or both arms of the levers.

The second feature of my improvement, is a mode of opening the valve or valves of the piston of a pump or machine for raising water: fig. 5, represents, in section, the upper cylinder or bucket, shown in connexion with the machinery in figs. 1, and 2, from whence the water is to be drawn by the ordinary operation of pumping; *a*, is the piston, supposed to be in the act of descending, at which time it is necessary that the valves *b*, *b*, should be opened to allow the water to pass through freely, and prevent a concussion which sometimes takes place from a confined volume of air, when the piston descends towards the surface of the water. To the upper part of the piston rod, a jointed arm *c*, is attached, which carries a small jointed arm *d*, at its end. The arm *c*, when fallen into the horizontal position, is stopped from descending further by a shoulder that moves upward freely. The smaller arm *d*, is in like manner stopped by a shoulder above, but is allowed to fall; it is, however, held in its straight position, by a weight or spring, and connected to it is a chain leading down to the valves.

Soon after the piston begins to descend into the cylinder, the end of the smaller arm *d*, comes against an elevation or tappet on the edge of a vertical side rail at *z*, which causes the arms *c*, and *d*, to be forced up into the inclined position shown in the figure, and thereby to draw up the cord or cords, chain or chains *e*, which lifts the valves *b*, *b*, and opens the water ways. When the piston has descended nearly to the bottom of its stroke, the arms *c*, *d*, by passing the recess *y*, are allowed to fall into their horizontal positions, as shown by dots at *w*, which allows the valves to close, and when the piston ascends again, the end of the arm *d*, comes against another tappet *x*, on the edge of the vertical rail, which forces down the arm *d*, as shown by dots at *v*, and the piston rises to the top of its stroke, having the valves closed.—[*Inrolled in the Rolls Chapel Office, December*, 1837.]

Specification drawn by Messrs. Newton and Berry.

To RICHARD SHEPPARD, *of Newport Pagnal, in the county of Buckingham, carpenter and builder, for his invention of improvements in tiles for covering roofs.*—[Sealed 17th August, 1835.]

THIS invention consists merely in making tiles with a peculiarly formed groove, so that when placed together, as on the roof of a house, they may fit tightly one into the other. Fig. 9, at Plate VI., represents a transverse section of two of these improved tiles connected together as they would be when used for covering the roof of a house. Fig. 10, represents the apparatus employed for forming the tiles, and which consists of two pressing rollers, the upper one having a groove of the required shape formed at one end of it; the lower roller carries a board, upon which the clay for making the tile is placed. It will be seen that this board also has a groove, similar to the one on the upper roller formed in it.

The Patentee has an apparatus for cutting the clay into the required thickness, which consists of a box having a set of strong wires placed horizontally across the end of the box, and the clay being forced out at that end, it comes out in the required thickness.

Fig. 11, represents the apparatus employed by the Patentee for cutting and trimming the tiles, and consists of a block *a*, on which the tile is placed for trimming, and which is of the same form as the tile; a double cutting-knife *b*, is also mounted on a pivot *c*, and the whole is mounted on a carriage that is made to slide in grooves, so that the tile may be subjected to the action of a press, which is placed in front, but is not shown in the drawing. After the workman has brought down the double cutting or trimming knife by the hand, and cut off or trimmed the tiles from any lumps or protuberances at the sides, which would prevent them from laying flat upon each other, he then pushes the board, knife and tile forward into the press, and subjects it to a considerable pressure, and when taken out it may be dried and burnt, and then it will be fit for use.

The Patentee says, in conclusion, that he does not mean or intend to claim as his invention, the apparatus for making the tiles, nor does he confine himself to that precise method of carrying his invention into effect; but what he claims as his invention is, the forming of tiles for roofs with a groove, by which the tiles may fit the one into the other, as above described.—[*Inrolled in the Inrolment Office, October*, 1838.]

To LOUIS ELISEE SEIGNETTE, *of Mincing-lane, in the city of London, merchant, for improvements in preserving animal and vegetable substances, being a communication from a foreigner residing abroad.*—[Sealed 21st March, 1836.]

THE Patentee, in his specification, has described several modes of preserving animal and vegetable substances, but they are all founded upon the same principle, namely, preventing oxygen from coming into contact with the substances to be preserved. The first process employed by the Patentee is as follows:—He takes the meat, either raw or partly cooked, and places it in a solution of salt and nitre for from four to twelve hours, according to the size of the pieces to be preserved. The meat is then packed in tin cases, and the atmospheric air contained therein is to be exhausted by an air pump or otherwise, so as to form a partial vacuum, which must be filled up with a solution of salt and water, or brine; the tin case must then be reversed, or placed head downwards in a vessel containing salt and water, and a quantity of carbonic acid gas is then allowed to run in from a pipe, or be pumped in, which will displace the salt and water; the tin case must then be fastened up in an air-tight manner.

The next method in which the Patentee proposes to preserve animal and vegetable substances from decay, is somewhat similar to the above, and rather more advantageous. By this method he does not require any vacuum to be made by means of an air pump, but merely fills the tin case, when ready packed with meat, with a brine, and then reverses it as in the former process in a vessel containing salt and water, and allows the carbonic acid gas to run into it; and to counteract or prevent the effect of any oxygen, a small bag of iron filings, or small pieces of iron, is put in the top of the case; and as the specific gravity of oxygen is less than that of carbonic acid, the oxygen will naturally rise to the upper part of the vessel, and enter into combination with the iron placed there for that purpose.

In the third process the Patentee dispenses with the use of salt and water and nitre altogether, and instead thereof he employs vinegar, in which he steeps the substances to be preserved; the tin cans are also filled with vinegar, which is displaced by the carbonic acid gas, as in the other process.

The Patentee here observes, that it may be as well to introduce a small piece of calcined charcoal into the upper part of each case, to counteract or destroy any disagreeable smell that may arise.

In preserving fish, the Patentee says, it should be lightly salted, and treated in other respects in the same manner as other animal substances; and to preserve vegetables, they should be first plunged into boiling hot water to preserve their form, and prevent them from changing colour.—[*Inrolled in the Inrolment Office, September*, 1836.]

To DAVID STEVENSON, *of Bath-place, New-road, in the county of Middlesex, gentleman, for a new method of preparing writing paper, from which writing ink cannot be expunged or abstracted without detection, being partly a communication from a foreigner residing abroad.*—[Sealed 2nd March, 1837.]

THIS invention is for making a metallic solution to be incorporated in writing paper, and which will not discolour, or present any difference in the outward appearance of the paper, but will immediately point out, by means of a stain, any attempt to erase any word from the paper, or expunge it by means of any chemical agent that will act upon writing ink; and although the invention is exceedingly simple, the Patentee has contrived to spin out his specification to a most immoderate length.

The invention merely consists in making a solution of manganese, combined with a solution of prussiate of potash, and introducing the same, when so combined, into the pulp vat while the paper is in the course of manufacture.

The manner in which the metallic solution is made is thus described by the Patentee:—"Take a quantity of the manganese of commerce, such as is used by paper-makers to make the bleaching gas, and add to it twice its weight of muriatic acid, and let the action of the acid upon the manganese be assisted by applying a gentle heat to the leaden or other vessel in which the aforesaid ingredients are placed. The gas which is thus evolved may be allowed to escape into the atmosphere, as it is of no use for the purposes to which this invention is applied, and it will not deteriorate the atmosphere. The clear fluid in the leaden or other vessel must then be drawn off, and a quantity of pulverised chalk or whiting mixed with water until it arrives at about the consistence of cream, must then be added, and after the effervescence occasioned by this addition has ceased, the mixture is then to be heated until near the boiling point, when it may be allowed to cool and settle, and the clear fluid drawn off. A small quantity of prussiate of potash must then be dissolved in some water, which might be made warm for the purpose of assisting the solution."

The Patentee does not inform us in what respective quantities the solutions of manganese and potash are to be mixed, but he states that three quarts of the mixture will be sufficient for one hundred weight of rags made into a pulp.

The claim set out at the conclusion of the specification is, for any metallic solution which does not discolour the paper, and which will answer the purpose required; namely, the detection of any intention or attempt to erase or expunge any letter or other mark upon paper so prepared.—[*Inrolled in the Inrolment Office, September,* 1837.]

SCIENTIFIC NOTICES.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from p. 50.)

March 20, 1838.

The PRESIDENT in the chair.

The abstract on the paper on the floating bridges having been read, Mr. Rendel remarked, that as the same velocity could not be acquired in the manner proposed as by a paddle-boat, the question to be considered was, as to the advantage of employing the floating bridge in preference in particular cases. They had to consider to what width of ferry the floating bridge is applicable; what the maximum velocity; what the expense of piers for paddle-boats. The great disadvantage of paddle-boats results from the difficulty of making fast, and of getting the cargo on and off. If we take as the measure of advantage the facility afforded by the floating bridge, then its superiority is very great. But the question is one of time, as well as of accommodation. He was of opinion, that a velocity of more than eight miles could not be attained by these boats. Now, if a paddle-boat could be impelled ten miles an hour, the time of landing, which would amount to ten minutes, would compensate for the increased speed.

He conceived that the chain might be applied to a distance of three miles; the time of crossing and the expense of the chain were the only limits. Mr. Parkes remarked, that Mr. Rendel undervalued the advantages of his plan. In crossing the Mersey, for instance, excepting at high and low water, they had to run up or down, whereas the floating bridge would go straight across. There was great loss of time and uncertainty with the paddle-boats. They were frequently only a quarter of an hour in crossing the Mersey, but he had himself been three-quarters of an hour in crossing from Liverpool to Birkenhead. A simple beach being sufficient for landing was a great gain, whereas to get paddle-boats alongside extensive and expensive piers are required.

volving shaft below the water line of the vessel, and running from stem to stern of the vessel.

Plate VI., fig. 6, represents so much of the stern of a vessel, having my apparatus applied thereto for propelling, as will enable me to explain the nature of my invention: *a*, being the shaft or axis on which the curved blades are set or affixed, this shaft or axis is to receive rotatory motion from a steam engine or other suitable power; *b*, *b*, are four curved blades, each a portion of a curve, which, if continued, would produce a screw; but here I would remark, that screws have been heretofore attempted to be used, and have failed of success, which has been owing to the water not being able to pass away, but that may be said to produce a choking action; and my intention is such, that there being only sections or portions of a screw employed, each blade is a propelling instrument, which allows the water to pass away in all directions, except at that point where the instrument is in full action: hence there is no choking or holding the water towards the centre of motion, which is the case in using complete screws.

Fig. 7, shows a portion of the shaft or axis, having only one blade or section of a screw, and fig. 8, shows an arrangement of two blades, one placed in the same line with the other; but I should state, that although this is an important improvement over the use of the complete screw, yet so far as my experience has gone, I have not found such an arrangement so good as the using each section of a screw or blade out of the line of all other blades, as is shown in fig. 6. The blades, it will be seen, are at the stern of the vessel, and the shaft on a line parallel with the keel, and the shaft, in passing through the vessel below the water line, is through a stuffing box in order to render the same water-tight.

It should be stated, that although I prefer to have the shaft above the keel, and in a parallel line with it, and the propellers at the stern of the vessel, I do not confine myself thereto, as a shaft or shafts below the water line having similar propellers, may be used at other parts of the vessel, such as at the sides or at the dead wood; but I believe that such arrangements are not so convenient as those shown by the drawing. And it should be stated, that I am aware that propellers, having somewhat similar action, were some years ago experimented on, and for which invention a patent was taken by Edward Shorter, such propellers being carried by certain outriggers over the bow of the vessel, as is shown and described in the specification of his patent, but the same failed. I do not, therefore, claim the application of curved blades generally, but my invention relates to the modes herein described of propelling vessels by applying one or more curved blades on shafts or axis below the water line of such vessels.—[*Inrolled in the Inrolment Office, September,* 1837.]

To JAMES BUCKINGHAM, *of Great Randolph-street, Camden-town, in the county of Middlesex, civil engineer, for his invention of certain improved combinations of machinery to be applied as mechanical agents in a great variety of situations, in which toothed gear and other mechanism have been heretofore employed.*—[Sealed 17th June, 1837.]

THIS invention consists, in the first place, in an improved arrangement of levers, to be acted upon by a rotary crank or cranks, whereby certain movements are obtained, which are peculiarly applicable, when in combination with other apparatus, to the raising of water from wells, mines, and other low situations, or with other suitable apparatus to raising loads or weights.

The arrangement of mechanism employed to effect the first mentioned object, is shown in Plate VI., at figs. 1, and 2, connected with a system of ascending and descending buckets, and other machinery, which forms the subject of a patent granted in England to Jacob Filton Slade, and dated the 11th day of January, 1836, in which patent right I am interested.

Fig. 1, represents a side elevation of my improved arrangement of two pairs of levers in connexion with a double crank, the shaft of which crank is mounted in suitable standards, and the fulcrum axle on which the levers turn, is also mounted in the same standards: fig. 2, is a front elevation of the same; *a, a,* are the standards or framework, supporting this part of the machinery; *b, b,* is the crank, the ends of its shaft turning in the standards —this crank shaft may be driven by a winch, by a band or pulley, or by toothed gear; *c, c,* is an upper shaft, also supported by the standards, which shaft forms the fulcrum or axle of the levers *d, d.* To any part of these levers, rods *e, e,* may be attached, as shown; and the reverse ends of these rods being connected to the cranks *b, b,* the rotation of the cranks will actuate the rods and levers, giving a reciprocating ascending and descending action to the levers. If, therefore, the buckets below be connected by rods, chains, or ropes, to the levers *d, d,* they will be raised and depressed alternately as the levers move up and down, which will effect the object desired, viz. raising and depressing, or working the buckets by a reciprocating action, for the purposes described in Slade's specification.

It is obvious, that this adaptation of levers and rods to cranks, for raising weights by reciprocating action, admits of some variations, viz. by placing the crank shaft above the shaft of the levers, or by the side of the lever shaft, observing, however, that the two shafts must be exactly parallel to each other. And a further variation may be made by employing double sets of levers; that is, two levers *d*, *d*, may be connected to each crank *b*, by means of rods *e*, *e*, as shown in figs. 3, and 4, that the chains, rods, or ropes for working the buckets (or raising any other weights by a reciprocating action), may, according to the lifting power required, be connected to any part of the levers between their fulcrums and extremities, and that the said chains, rods, or ropes for lifting may be attached to one or both arms of the levers.

The second feature of my improvement, is a mode of opening the valve or valves of the piston of a pump or machine for raising water: fig. 5, represents, in section, the upper cylinder or bucket, shown in connexion with the machinery in figs. 1, and 2, from whence the water is to be drawn by the ordinary operation of pumping; *a*, is the piston, supposed to be in the act of descending, at which time it is necessary that the valves *b*, *b*, should be opened to allow the water to pass through freely, and prevent a concussion which sometimes takes place from a confined volume of air, when the piston descends towards the surface of the water. To the upper part of the piston rod, a jointed arm *c*, is attached, which carries a small jointed arm *d*, at its end. The arm *c*, when fallen into the horizontal position, is stopped from descending further by a shoulder that moves upward freely. The smaller arm *d*, is in like manner stopped by a shoulder above, but is allowed to fall; it is, however, held in its straight position, by a weight or spring, and connected to it is a chain leading down to the valves.

Soon after the piston begins to descend into the cylinder, the end of the smaller arm *d*, comes against an elevation or tappet on the edge of a vertical side rail at *x*, which causes the arms *c*, and *d*, to be forced up into the inclined position shown in the figure, and thereby to draw up the cord or cords, chain or chains *e*, which lifts the valves *b*, *b*, and opens the water ways. When the piston has descended nearly to the bottom of its stroke, the arms *c*, *d*, by passing the recess *y*, are allowed to fall into their horizontal positions, as shown by dots at *w*, which allows the valves to close, and when the piston ascends again, the end of the arm *d*, comes against another tappet *x*, on the edge of the vertical rail, which forces down the arm *d*, as shown by dots at *v*, and the piston rises to the top of its stroke, having the valves closed.—[*Inrolled in the Rolls Chapel Office, December*, 1837.]

Specification drawn by Messrs. Newton and Berry.

To RICHARD SHEPPARD, *of Newport Pagnal, in the county of Buckingham, carpenter and builder, for his invention of improvements in tiles for covering roofs.*—[Sealed 17th August, 1835.]

THIS invention consists merely in makingt iles with a peculiarly formed groove, so that when placed together, as on the roof of a house, they may fit tightly one into the other. Fig. 9, at Plate VI., represents a transverse section of two of these improved tiles connected together as they would be when used for covering the roof of a house. Fig. 10, represents the apparatus employed for forming the tiles, and which consists of two pressing rollers, the upper one having a groove of the required shape formed at one end of it; the lower roller carries a board, upon which the clay for making the tile is placed. It will be seen that this board also has a groove, similar to the one on the upper roller formed in it.

The Patentee has an apparatus for cutting the clay into the required thickness, which consists of a box having a set of strong wires placed horizontally across the end of the box, and the clay being forced out at that end, it comes out in the required thickness.

Fig. 11, represents the apparatus employed by the Patentee for cutting and trimming the tiles, and consists of a block *a*, on which the tile is placed for trimming, and which is of the same form as the tile; a double cutting-knife *b*, is also mounted on a pivot *c*, and the whole is mounted on a carriage that is made to slide in grooves, so that the tile may be subjected to the action of a press, which is placed in front, but is not shown in the drawing. After the workman has brought down the double cutting or trimming knife by the hand, and cut off or trimmed the tiles from any lumps or protuberances at the sides, which would prevent them from laying flat upon each other, he then pushes the board, knife and tile forward into the press, and subjects it to a considerable pressure, and when taken out it may be dried and burnt, and then it will be fit for use.

The Patentee says, in conclusion, that he does not mean or intend to claim as his invention, the apparatus for making the tiles, nor does he confine himself to that precise method of carrying his invention into effect; but what he claims as his invention is, the forming of tiles for roofs with a groove, by which the tiles may fit the one into the other, as above described.—[*Inrolled in the Inrolment Office, October,* 1838.]

To Louis Elisee Seignette, *of Mincing-lane, in the city of London, merchant, for improvements in preserving animal and vegetable substances, being a communication from a foreigner residing abroad.*—[Sealed 21st March, 1836.]

The Patentee, in his specification, has described several modes of preserving animal and vegetable substances, but they are all founded upon the same principle, namely, preventing oxygen from coming into contact with the substances to be preserved. The first process employed by the Patentee is as follows:—He takes the meat, either raw or partly cooked, and places it in a solution of salt and nitre for from four to twelve hours, according to the size of the pieces to be preserved. The meat is then packed in tin cases, and the atmospheric air contained therein is to be exhausted by an air pump or otherwise, so as to form a partial vacuum, which must be filled up with a solution of salt and water, or brine; the tin case must then be reversed, or placed head downwards in a vessel containing salt and water, and a quantity of carbonic acid gas is then allowed to run in from a pipe, or be pumped in, which will displace the salt and water; the tin case must then be fastened up in an air-tight manner.

The next method in which the Patentee proposes to preserve animal and vegetable substances from decay, is somewhat similar to the above, and rather more advantageous. By this method he does not require any vacuum to be made by means of an air pump, but merely fills the tin case, when ready packed with meat, with a brine, and then reverses it as in the former process in a vessel containing salt and water, and allows the carbonic acid gas to run into it; and to counteract or prevent the effect of any oxygen, a small bag of iron filings, or small pieces of iron, is put in the top of the case; and as the specific gravity of oxygen is less than that of carbonic acid, the oxygen will naturally rise to the upper part of the vessel, and enter into combination with the iron placed there for that purpose.

In the third process the Patentee dispenses with the use of salt and water and nitre altogether, and instead thereof he employs vinegar, in which he steeps the substances to be preserved; the tin cans are also filled with vinegar, which is displaced by the carbonic acid gas, as in the other process.

The Patentee here observes, that it may be as well to introduce a small piece of calcined charcoal into the upper part of each case, to counteract or destroy any disagreeable smell that may arise.

In preserving fish, the Patentee says, it should be lightly salted, and treated in other respects in the same manner as other animal substances; and to preserve vegetables, they should be first plunged into boiling hot water to preserve their form, and prevent them from changing colour.—[*Inrolled in the Inrolment Office, September*, 1836.]

To David Stevenson, *of Bath-place, New-road, in the county of Middlesex, gentleman, for a new method of preparing writing paper, from which writing ink cannot be expunged or abstracted without detection, being partly a communication from a foreigner residing abroad.*—[Sealed 2nd March, 1837.]

This invention is for making a metallic solution to be incorporated in writing paper, and which will not discolour, or present any difference in the outward appearance of the paper, but will immediately point out, by means of a stain, any attempt to erase any word from the paper, or expunge it by means of any chemical agent that will act upon writing ink; and although the invention is exceedingly simple, the Patentee has contrived to spin out his specification to a most immoderate length.

The invention merely consists in making a solution of manganese, combined with a solution of prussiate of potash, and introducing the same, when so combined, into the pulp vat while the paper is in the course of manufacture.

The manner in which the metallic solution is made is thus described by the Patentee:—"Take a quantity of the manganese of commerce, such as is used by paper-makers to make the bleaching gas, and add to it twice its weight of muriatic acid, and let the action of the acid upon the manganese be assisted by applying a gentle heat to the leaden or other vessel in which the aforesaid ingredients are placed. The gas which is thus evolved may be allowed to escape into the atmosphere, as it is of no use for the purposes to which this invention is applied, and it will not deteriorate the atmosphere. The clear fluid in the leaden or other vessel must then be drawn off, and a quantity of pulverised chalk or whiting mixed with water until it arrives at about the consistence of cream, must then be added, and after the effervescence occasioned by this addition has ceased, the mixture is then to be heated until near the boiling point, when it may be allowed to cool and settle, and the clear fluid drawn off. A small quantity of prussiate of potash must then be dissolved in some water, which might be made warm for the purpose of assisting the solution."

The Patentee does not inform us in what respective quantities the solutions of manganese and potash are to be mixed, but he states that three quarts of the mixture will be sufficient for one hundred weight of rags made into a pulp.

The claim set out at the conclusion of the specification is, for any metallic solution which does not discolour the paper, and which will answer the purpose required; namely, the detection of any intention or attempt to erase or expunge any letter or other mark upon paper so prepared.—[*Inrolled in the Inrolment Office, September,* 1837.]

SCIENTIFIC NOTICES.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from p. 50.)

March 20, 1838.

The President in the chair.

The abstract on the paper on the floating bridges having been read, Mr. Rendel remarked, that as the same velocity could not be acquired in the manner proposed as by a paddle-boat, the question to be considered was, as to the advantage of employing the floating bridge in preference in particular cases. They had to consider to what width of ferry the floating bridge is applicable; what the maximum velocity; what the expense of piers for paddle-boats. The great disadvantage of paddle-boats results from the difficulty of making fast, and of getting the cargo on and off. If we take as the measure of advantage the facility afforded by the floating bridge, then its superiority is very great. But the question is one of time, as well as of accommodation. He was of opinion, that a velocity of more than eight miles could not be attained by these boats. Now, if a paddle-boat could be impelled ten miles an hour, the time of landing, which would amount to ten minutes, would compensate for the increased speed.

He conceived that the chain might be applied to a distance of three miles; the time of crossing and the expense of the chain were the only limits. Mr. Parkes remarked, that Mr. Rendel undervalued the advantages of his plan. In crossing the Mersey, for instance, excepting at high and low water, they had to run up or down, whereas the floating bridge would go straight across. There was great loss of time and uncertainty with the paddle-boats. They were frequently only a quarter of an hour in crossing the Mersey, but he had himself been three-quarters of an hour in crossing from Liverpool to Birkenhead. A simple beach being sufficient for landing was a great gain, whereas to get paddle-boats alongside extensive and expensive piers are required.

"The Land Surveyor's Calculator." By George Heald.

The instrument to which the above name is assigned, was invented for the purpose of avoiding the necessity of performing long arithmetical calculations in surveying estates; the results are given at once by the adaptation and inspection of the instrument. It may also be applied to extracting the square roots of numbers, and to the other purposes to which the Gunter's scale is applicable.

The instrument consists of five concentric circles, whereof the four inner ones are on the outer edge of a card moveable about a centre, and the fifth on the outer circle is fixed. The circumferences of the two outer circles—that is, of the fixed circle, and the circle at the edge of the moveable card—are divided into 1000 logarithmic portions representing links, the divisions being carried round in a contrary order, on the two circles. The third circle is divided to represent acres; the fourth to represent perches; and the fifth, or innermost circle, expresses the area in acres, roods, and perches.

The author then describes the method of using the instrument for the solution of questions similar to the following. Knowing the diagonal and the two perpendiculars of a quadrilateral, or the base and perpendicular of a triangle, to determine the areas of the respective figures; the result is known at once in acres, roods, and perches, on inspecting the fourth or fifth circle, according as the area is greater or less than half an acre. The instrument may also be applied to computing square yards; to extracting square roots of numbers; and to the ordinary operations of multiplication and division, in the same manner as other logarithmic lines.

A great advantage of this instrument results from the graduation being on the circumference of a circle. Great enlargement of the divisions is thus obtained, and in a far more convenient form than by drawing a slide, as on the common sliding rule; the diameter of the outer circle in this instrument is sixteen inches. The author considers that a circle of eight inches diameter would be sufficiently accurate for practical purposes; and such an instrument would be extremely compact and portable.

Professor Willis gave a brief account of his investigations on the forms best adapted for the teeth of wheels, and exhibited several models of teeth. The subject might be conceived to be worn almost threadbare, so much has been written and said about it; and practical men seemed well satisfied with the forms already in use, and the principles on which they were made. These did not, however, appear to him as the best suited to the wants of modern practice. It was a general opinion that only certain curves were adapted for the teeth of wheels—namely, the epicycloidal; he trusted he should be able to show that there were many others. He believed he had laid down a method of drawing a curve suited to all the wants of modern practice; in general, teeth are epicycloidal with radial straight lines. The consequence is, that a wheel of 50 teeth made in the usual manner to work with one of 30, will not work with one of 60; and to effect any other combination the founder must make a new set of patterns for every new combination, instead of having but one pattern of tooth; and he should endeavour to show how the epicycloid might be adapted, so that the same wheel may drive two or more whose number of teeth is different. Another most important problem was, that having a tooth of any given form to determine a tooth which would work correctly with it.

Such were some of the general features to which his attention had been directed, and the practical method of effecting these objects being fully set forth in his paper, he should merely show the application as made for the workshop.

March 27, 1838.

The PRESIDENT in the chair.

"The Canal Lifts on the Grand Western Canal." By James Green, M. Inst. C. E.

The lift, which is the subject of the following paper, was erected by Mr. Green in the year 1835, on the Grand Western Canal, and has been in operation ever since. Lifts are not intended to supersede the use of canals in all cases, but in those in which a considerable ascent is to be overcome in a short distance, and in which the water is inadequate to the consumption of a common lock, or in which the funds are inadequate to the execution of the work on a scale adapted to such locks.

This lift is 46 feet in height, and consists of two chambers, similar to those of a common lock, with a pier of masonry between them; each chamber being of sufficient dimensions to admit of a wooden cradle, in which the boat to ascend or descend floats. The cradle being on a level with the pond of the canal, a water-tight gate at the end of the cradle and of the pond of the canal is raised up, and leaves the communication betwixt the water in the canal and in the cradle free, and the boat swims into or out of the cradle.

The cradles are balanced over three cast-iron wheels of 16 feet in diameter, to the centre of one of which is fitted spur and bevil gear, so that the motion may be given by machinery worked by the hand, without any preponderating weight of water in the cradle, when scarcity of water renders this necessary. To this hand-gear is also attached brake wheels and a brake lever for regulating the motion. For the details of the construction of this machinery, and of the manner in which the lifts are worked, reference must be had to the drawings.

It is obvious that the weights of the additional length of the suspending chains on the side of the cradle which is the lowest must be counterbalanced; for this purpose there is attached to the under side of each cradle a chain of equal weight per foot with the suspending chain, and this elongates under the ascending and is shortened under the descending cradle; thus the disparity in the weights due to the suspending chain is obviated.

It is so arranged that the water in the upper cradle is about two inches below the level of the water in the pond: the consequence of which is, that the upper cradle has a slight preponderance first, sufficient to set the machinery in motion; the weight of this water is generally about one ton; it may, however, be regulated at pleasure.

The strength of materials is the great desideratum in machinery of this nature, and though the lift here described is but 46 feet, and the boats about 8 tons, the same method is applicable to much greater height and larger tonnage. The advantages of these lifts over common locks are great economy of construction, and great saving of time and water.

The time occupied in passing one boat up and another down this lift of 46 feet is three minutes, whereas thirty minutes would be required to attain the rise of 46 feet by locks; thus the saving in time amounts to $\frac{8}{10}$ths for boats of eight tons.

The quantity of water consumed is about two tons for eight tons of cargo, whereas in common locks it is about three tons of water per ton of cargo; the saving is therefore 22 parts out of 24, or very nearly 92 per cent. If the trade were all downward, there would, by the use of these lifts, be carried from the lowest to the highest level of the canal a quantity of water equal to the loads passed down.

Mr. Green stated, in reply to several questions, that in some parts of the canal it had been found impracticable to get a sufficient drain to empty the chamber—they were compelled, therefore, to use a half lock of 18 inches fall; that there were seven lifts and one inclined plane on the canal, effecting a rise of 262 feet in eleven miles. That he should not recommend them as applicable to boats of more than 20 to 30 tons. The width of larger boats was an obstacle. They were extremely advantageous for narrow canals; for boats of 50 or60 feet in length, and about 30 tons.

Mr. Parkes remarked, that he considered the question of narrow canals as a most important one—the advantage to be derived from narrow canals was a subject to which sufficient attention had not been paid.

The President called attention to the remark in Mr. Green's paper respecting the quantity of water carried up from one level to another in a downward trade wherever these Lifts are used; then a coal country on high level may supply itself with as much water as it sends down coal. The subject of inclined planes being alluded to, especially those of the Morristown Canal of 200 feet each, where a rise of 1600 feet is effected by eight inclined planes, Mr. G. remarked, that more water and time must be expended, the friction and length being much greater. In the lifts there was only as much water consumed as was equal to the load, but that he should not consider them as practically applicable to more than 60 or 70 feet. Favourable levels, with ascents of more than 60 or 70 feet, could seldom be found; could he have had the choice of the line in this particular instance, he should have effected by four lifts the rise for which seven are now employed.

Some farther observations on the evaporation of water, by Josiah Parkes, were read. The author calls attention to the importance of ascertaining the evaporation of boilers, and of masters having a regular report of the work done, and of the fuel consumed. Attention should also be directed to the settling of the boilers, and their general management. The defects which generally exist are inadequate boiler power, insufficient covering, and absence of good reservoirs. A little attention to these points, on the part of respectable engine-makers, would lead to definite knowledge, and put an end to the pretensions of the empyric.

The paper is accompanied by a table, showing the proportionate parts of 112 lbs. of coal burnt in heating water from 32 degrees to 212 degrees with that burnt in evaporating it from 212 degrees. It is constructed on the established principle of the sum of latent and sensible heat being constant, and is of great use in reducing the results of numerous experiments to one common standard, and ascertaining the value of fuel; and in comparing one set of experiments with another, when the water has been supplied to the boilers at different temperatures.

The evaporation of water as stated by Mr. Manby, in the experiment with Collier's boiler, being reduced to the same standard as others in his paper, it appeared that 20·24 cubic feet were evaporated from 212 degrees F. with 112 lbs. of coal. The quantity evaporated at the Fowey Consols was 21·37 cubic feet.

It appeared, on comparing the value of the Locomotive Engine and the Cornish Engine by the quantity of coals consumed, per horse power, they were 1 to 35.

The difference in the heating effects of coke and coal having been observed, Mr. Parkes remarked that the heat generated depended on the ratio of the rate of absorption of the oxygen; there must be more space betwixt the bars when coke than when coal is consumed, and the quantity of oxygen required is much greater in the former than in the latter case. More air, however, may be drawn through the bars than can possibly enter into combustion, and the general temperature is lowered in consequence.

The comparative value of coke and coal in melting glass had been observed by Mr. Pellatt, and it appeared that 21 tons of coke produced the same effect as 26 tons of the best coal.

April 3, 1838.

The President in the chair.

"On the Teeth of Wheels." By Robert Willis Jacksonian Professor of Natural Philosophy in the University of Cambridge.

The geometry of the subject of the teeth of wheels may be considered as complete, but it appears that important additions may be made to its practical applications. The general problem s, having given a tooth of any form to determine one which shall work correctly with it. The method of effecting this may be shown in a simple practical manner. The curve to be traced out, which is the shape of the required tooth, is the locus of the intersections of all the outlines of the tooth in every one of its positions. The motion produced by the mere contact of the curve so traced out with the given tooth will be uniform. This, then, is a practical mode of showing the practicability of the problem.

The epicycloids and involutes have hitherto, from the facility with which they can be described, being almost universally employed, and practice has been confined to the class of epicycloids which work correctly with straight lines or circles. The defect under which such wheels labour is, that a wheel of fifty teeth of the same pitch will not work correctly with a wheel of one hundred teeth of the same pitch; since the diameter of the describing circle by which the epicycloid is formed, must be made equal to the radius of the pitch circle of the wheel with which the teeth are to work, and will therefore be twice as large in the second case as in the first. Also, if the teeth be epicycloids, generated by a circle whose radius is equal to that of the wheel with which it is to work, which is equally correct, the same remark applies.

This defect was of no great consequence when the teeth were wooden, but it is of great consequence in iron wheels, since the founder must have a new pattern of a wheel of forty teeth for every combination that it may be required to make of this wheel with others. It is desirable that the teeth of wheels be formed so that any tooth may work correctly with any other of the same pitch. This is the case with involute teeth, but the obliquity of the action is an objection to their introduction. The requisite property may be given to epicycloidal teeth, by employing the following proposition. If there be two pitch circles touching each other, an epicycloidal tooth formed by causing a given describing circle to roll on the exterior circumference of the first. will work correctly with an interior epicycloid formed by causing the same describing circle to roll on the interior circumference of the second.

From this Professor Willis deduces the corollary, that if for a set of wheels of the same pitch a constant describing circle be taken and employed to trace those portions of the teeth which project beyond each pitch line by rolling on the exterior circumference, and those which lie within it by rolling on its interior circumference, then any two wheels of the set will work correctly together. This corollary is new, and constitutes the basis of the system already alluded to.

It only remains to settle the diameter of this constant describing circle. The simplest considerations serve to show that the diameter of the constant describing circle must not be greater than the radius of the pitch circle; hence, as a convenient rule, make its diameter equal to the radius of the least pitch circle of the set. This rule is perfectly general, applying to racks and large wheels, as well as to annular or internal wheels. The simplicity of this above the old system is obvious, for on the old every epicycloid requires two circular templets; also there must be as many templets as pitch circles in the set, whereas on this system but one describing templet is required.

For machinery in which the wheels move constantly in the same direction, the strength of the teeth may be nearly doubled for the same quantity of material, by disposing it so that the backs are an involute or the arc of a circle, the acting faces being of the usual form.

In the preceding the exact forms have been described; the author then proceeds to ascertain forms sufficiently accurate for practice, and which are arcs of circles. Euler suggested the substitution of arcs of circles of curvature instead of the curves themselves. The portion of a curve employed in practice is so small, that a circular arc is sufficiently accurate, provided the centre and radius with which it is struck be determined by some accurate method than by mere trial. With this view Professor Willis was led to investigate a method in which the nature and properties of curves proper for teeth are entirely neglected, and a simple construction shown by which a pair of centres may be at once assigned for a given pair of wheels, whence arcs may be struck that will answer the purpose of enabling these wheels to work correctly together.

The nature of the motion produced by the pressure of one circular arc against another is then examined and reduced to that of a system of three rods, the middle one of which is jointed to two others, moveable at their other extremity about a fixed centre; and a simple construction is arrived at by which we may always find a pair of centres for which two circular arcs may be struck through any point, which will drive each other truly for a small distance on each side of that point. This point, when the side of a tooth consists only of a single arc, should be on the line of centres. It is, however, more advantageous that the tooth should consist of two arcs, for then there will be two points at which the action is exact—one a little before reaching the line of centres, the other a little after passing it.

From these investigations, the author was led to construct an instrument for setting out the teeth of wheels, which may be used with perfect facility by the workmen, and which has been termed an Odontograph, the application of which is fully described. The paper contains many practical observations connected with this subject, tables, &c., and concludes with some directions for ascertaining the correct form of cutters.

"On the Ventilation of Tunnels." By W. West.

This paper contains an account of some experiments on the temperature of the air in a tunnel on the Leeds and Selby Railway. There are three shafts in the tunnel; and he observes, the temperature of the external air being 34 degrees, the temperature at the mouth and as far as the first shaft was 34½ degrees, but that immediately beyond this shaft it rose to 35 degrees, and increased uniformly up to the farther end, at which point it was 57 degrees. From this fact, the author infers that the air passed up the shaft and that, the tunnel would be more completely ventilated without any shafts: and that shafts generally are an impediment to perfect ventilation.

Mr. Carpmael described and illustrated by a model the apparatus invented by Mr. Worsdale, for changing the letter bags on the railways without diminishing the speed at which the carriages are travelling. The bag to be taken up is hung on an arm projecting from a post, generally a lamp-post, and the bag to be left is suspended at the end of a rod projecting from the back of the railway carriage. The guard knows the exact distance to which this rod is to be pushed out; and the projecting iron of the lamp-post receives the bag to be left at the same instant as a projecting iron on the guard's rod sweeps off the bag to be taken up. This exchange is certain, and effected without any loss of time.

List of Patents

Granted in Scotland between 22d September and 22d October, 1838.

To William Robert Sievier, of Henrietta-street, Cavendish-square, London, for certain improvements in looms for weaving, and in the mode or method of producing figured goods or fabrics.—1st October.

— John Robb, 13, Commercial-road, Hutcheson-town, Glasgow, mechanic, for a machine for preparing wood for joiners, carpenters, and others.—2nd October.

— Edmund Henzie, of Fenton's Hotel, Saint James's-street, London, merchant, in consequence of a communication made to him by a foreigner, residing abroad, for improvements in the manufacture of dextrine.—8th October.

— William Robert Sievier, of Henrietta-street, Cavendish-square, London, for certain improvements in rigger and pulley bands for driving machinery, and ropes and lines for other purposes.—11th October.

— James Nasmyth, of Patricroft, near Manchester, engineer, for certain improvements in machinery tools, or apparatus, for cutting or planing metals and other substances, and in securing or fastening the keys or cottars used in such machinery, and other machinery, where keys or cottars are commonly applied.—11th October.

To Thomas Ridgway Bridson, of Great Bolton, bleacher, for certain improvements in the construction and arrangement of machinery or apparatus for stretching, mangling, drying, and finishing woven goods or fabrics, and a part or parts of which improvements are applicable to other useful purposes.—12th October.

— William Angus Robertson, of Peterborough-court, and Fleet-street, London, for certain improvements in the manufacture of hosiery, shawls, carpets, rugs, blankets, and other fabrics, being a communication from a foreigner residing abroad.—12th October.

— John Seaward, of the Canal Iron-works, Poplar, county of Middlesex, engineer, for an improvement in condensing steam engines.—12th October.

— John Wordsworth, of Leeds, machine maker, for improvements in machinery for heckling and dressing flax, hemp, and other fibrous materials.—18th October.

— John Melling, of Liverpool, for certain improvements in locomotive steam carriages, to be used on railways or other roads, part or parts of which improvements are also applicable to stationary steam engines, and to machinery in general.—18th October.

— Horace Corry, of Murrow-street, Limehouse, Middlesex, M.D., for improvements in the manufacture of white lead.—18th October.

— Henry Huntley Mohun, of Regent's Park, M.D., for improvements in the composition and manufacture of fuel, and in furnaces for the consumption of such and other kinds of fuel.—18th October.

New Patents
SEALED IN ENGLAND.
1838.

To John White, of Haddington, North Britain, ironmonger, for his invention of certain improvements in the construction of ovens, and heated air stoves.—Sealed 27th September—6 months for inrolment.

To John Bourne, of the city of Dublin, engineer, for his invention of certain improvements in steam engines, and in the construction of boilers, furnaces, and stoves.—Sealed 8th October—6 months for inrolment.

To Jehiel Forbes Norton, of Manchester, merchant, for certain improvements on stoves or furnaces, and in instruments or apparatus for making the same, being a communication from a foreigner residing abroad.—Sealed 8th October—6 months for inrolment.

To Henry. Dunnington, of Nottingham, lace-manufacturer, for his invention of certain improvements in warp machinery, and in fabrics produced by warp machinery.—Sealed 8th October—6 months for inrolment.

To George Haden, of Trowbridge, in the county of Wilts, engineer, for his invention of improvements in the manufacture of a soap or composition applicable to the felting and other processes employed in the manufacture of woollen cloth and other purposes to which soap is usually employed.—Sealed 8th October—6 months for inrolment.

To Charles Sanderson, of Sheffield, steel manufacturer, for his invention of a certain improvement in the art or process of smelting iron ores.—Sealed 11th October—6 months for inrolment.

To Matthew Heath, of Furnival's-inn, in the city of London, Esq., for improvements in clarifying and filtering water, beer, wine, and other liquids, being a communication from a foreigner residing abroad.—Sealed 11th October—6 months for inrolment.

To John Fowler, of Birmingham, gentleman, for his invention of certain improvements in preparing or manufacturing sulphuric acid.—Sealed 16th October—6 months for inrolment.

To William Brockedon, of Queen-square, in the county of Middlesex, Esq., for his invention of a combination of known materials, forming a substitute for corks and bungs.—Sealed 17th October—6 months for inrolment.

To Henry Meyer, of Piccadilly, wax chandler and oil merchant, for improvements in the manufacture of lamps, being a communication from a foreigner residing abroad.—Sealed 17th October—6 months for inrolment.

To George Harrison, of Carlton House-terrace, surveyor, for his invention of improvements for supplying air for promoting and supporting the combustion of fire in close stoves and furnaces, and for economising fuel therein.—Sealed 17th October—6 months for inrolment.

To Elias Robison Handcock, of the city of Dublin, for his invention of improvements in castors for furniture and other purposes.—Sealed 17th October—6 months for inrolment.

To William Edward Newton, of the Office for Patents, Chancery-lane, in the county of Middlesex, patent agent, for improvements in the construction of bridges, viaducts, piers, roofs, truss girders, and stays for architectural purposes, being a communication from a foreigner residing abroad.—Sealed 17th October—6 months for inrolment.

To John George Bodmer, of Manchester, engineer, for his invention of certain improvements in the machinery or apparatus for carding, drawing, roving, and spinning cotton, flax, wool, silk, and other fibrous substances.—Sealed 22d October—6 months for inrolment.

To William Jeakes, of Great Russell-street, Bloomsbury, in the county of Middlesex, ironmonger, for his invention of a mode of applying ventilating apparatus to stoves, constructed on Dr. Arnott's principle.—Sealed 22d October —6 months for inrolment.

To William Edward Newton, of the Office for Patents, Chancery-lane, in the county of Middlesex, mechanical draftsman, for an improved method or methods of preparing certain substances for the preservation of wood and other materials used in the construction and fitting up of houses, ships, and other works, which improvements are also applicable to other useful purposes, being a communication from a foreigner residing abroad.—Sealed 22d October—6 months for inrolment.

To John Henfrey, of Weymouth-terrace, Shoreditch, in the county of Middlesex, engineer and machinist, for his invention of certain improvements in the manufacture of hinges or joints, and in the machinery employed therein.—Sealed 25th October—6 months for inrolment.

CELESTIAL PHENOMENA, FOR NOVEMBER, 1838.

D.	H.	M.	
1			Clock after the sun, 16m. 15s.
	—		☽ rises 4h. 4m. A.
	—		☽ passes mer. 11h. 38m. A.
	—		☽ sets 6h. 1m. M.
			Encke's Comet R. A. 20h. 55m. dec. 64. 52. N.
			Ditto passes mer. 6h. 21m.
2	0	25	Ecliptic oppo. or ○ full moon.
4	0	28	☿ in sup. conj. with the sun.
5			Clock after the sun, 16m. 14s.
	—		☽ rises 6h. 27m. A.
	—		☽ passes mer. 3h. 38m. M.
	—		☽ sets 11h. 49m. M.
			Encke's Comet R. A. 19h. 3m. dec. 56. 52. N.
			Ditto passes mer. 4h. 13m.
	15	10	☿ in the descending node.
9	2	49	☽ in □ or last quarter.
	23	45	♂ in conj. with the ☽ diff. of dec. 0. 56. S.
10			Clock after the sun, 15m. 55s.
	—		☽ rises morn.
	—		☽ passes mer. 6h. 58m. M.
	—		☽ sets 2h. 12m. A.
			Encke's Comet R. A. 17h. 43m. dec. 41. 1. N.
			Ditto passes mer. 2h. 31m.
12	10		☽ in Apogee.
13	4	40	♃ in conj. with the ☽ diff. of dec. 1. 59. N.
14	16	10	♃'s first satt. will im.
15			Clock after the sun, 15m. 14s.
	—		☽ rises 5h. 20m. M.
	—		☽ passes mer. 10h. 17m. M.
	—		☽ sets 3h. 3m. A.
			Encke's Comet R. A. 17h. 1m. dec. 25. 27. N.
			Ditto passes mer. 1h. 27m.
16	6	24	♀ in conj. with the ☽ diff. of dec. 4. 42. N.
	7	49	♀ in conj. with ♄ diff. of dec. 3. 8. S.
17			Mer. R. A. 15h. 59m. dec. 21. 47. S.
	—		Venus R. A. 14h. 59m. dec. 16. 6. S.
	—		Mars R. A. 10h. 36m. dec. 10. 50. N.
	—		Vesta R. A. 7h. 4m. dec. 19. 54. N.
	—		Juno R. A. 18h. 35m. dec. 14. 2. S.
17			Pallas R. A. 11h. 42m. dec. 8. 0. S.
	—		Ceres R. A. 12h. 14m. dec. 8. 14. N.
	—		Jupiter R. A. 12h. 41m. dec. 3. 9. S.
	—		Saturn R. A. 15h. 55m. dec. 18. 34. S.
	—		Georg. R. A. 22h. 42m. dec. 9. 6. S.
	—		Mercury passes mer. 0h. 15m.
	—		Venus passes mer. 23h. 16m.
	—		Mars passes mer. 18h. 50m.
	—		Jupiter passes mer. 20h. 54m.
	—		Saturn passes mer. 0h. 11m.
	8	2	Ecliptic conj. or ● new moon.
	10	15	♄ in conj. with the ☽ diff. of dec. 6. 16. N.
	13	37	☿ in conj. with the ☽ diff. of dec. 3. 15. N.
18	2	24	♅ stationary.
20			Clock after the sun, 14m. 12s.
	—		☽ rises 11h. 19m. M.
	—		☽ passes mer. 2h. 31m. A.
	—		☽ sets 5h. 44m. A.
			Encke's Comet R. A. 16h. 26m. dec. 22. 46. N.
			Ditto passes mer. 22h. 29m.
21	18	4	♃'s first satt. will im.
23	13	29	♄ in conj. with the sun.
24	6	32	☽ in □ or first quarter.
	16	46	♅ in conj. with the ☽ diff. of dec. 1. 25. N.
25			Clock after the sun, 12m. 50s.
	—		☽ rises 1h. 28m. M.
	—		☽ passes mer. 6h. 55m. A.
	—		☽ sets morn.
			Encke's Comet R. A. 16h. 19m. dec. 3. 39. N.
			Ditto passes mer. 23h. 58m.
28	11		☽ in Perigee.
29	0	27	♀ in conj. with ♄ diff. of dec. 1. 18. S.
	18	6	♃'s second satt. will im.
30			Clock after the sun, 11m. 9s.
	—		☽ rises 2h. 48m. A.
	—		☽ passes mer. 11h. 16m. A.
	—		☽ sets 6h. 33m. M.
			Encke's Comet R. A. 16h. 7m. dec. 3. 37. S.
			Ditto passes mer. 23h. 27m.
	17	9	♅ in □ with the ☉

J. LEWTHWAITE, Rotherhithe.

THE

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CONJOINED SERIES.

No. LXXXI.

Recent Patents.

To James Dutton, *of Wotton-under-Edge, in the county of Gloucester, clothier, for his invention of certain improvements in the manufacture of woollen cloth, which improvements apply both to weaving and dressing of woollen cloth.*—[Sealed 8th February, 1838.]

These improvements in the manufacture of woollen cloth, which apply both to weaving and dressing, consist, as regards weaving, firstly, in the general construction and arrangement of the parts constituting a loom for weaving woollen cloths by rotary power; secondly, in an improved mode of clothing the warp beam of a woollen loom, for the purpose of laying the yarns upon the beam with greater regularity and uniformity of tension than can be effected by the old methods of beaming warps; thirdly, in a peculiar construction of healds for opening the warps previously to shooting the weft, and also of the reed for beating up the work; fourthly, the adaptation of apparatus intended to operate as perpetual temples; and fifthly, in a peculiar method or methods of rendering the delivery of the warp-yarns contingent upon the taking up of the cloth.

As regards the dressing of the surface of cloths, my improvements consist in the construction of a machine in which the cloth is distended and progressively passed forward, and the pile is raised as the cloth proceeds, by means of a rotary cylinder, the periphery of which is covered with teasles, or wire cards, or brushes, and the cylinder made to revolve with an accelerated speed in the same direction as the cloth proceeds; and the cloth is pressed against the surface of the said teasles or wires by an adjustable roller, mounted in a frame formed of compound levers, weighted so as to give any required pressure. In this machine, a rotary shearing apparatus may also be mounted, and applied to cropping the surface of the pile of the cloth; and pressing the cloth may likewise be effected in the same machine, by substituting heated rollers in the place of those above described, for raising the pile; and the operation of brushing the face of the cloth may be performed in the same machine, by mounting a brushing roller in the same manner as the teasle cylinder above described.

And, lastly, my improvements consist in certain additions to the apparatus for dressing and finishing woollen cloths, and the method or methods of, and apparatus for effecting the same, for which I obtained a patent in England, dated the 13th day of May, 1834.*

Fig. 1, Plate VII., is a front elevation of a loom, to which my improved construction and arrangement of parts are adapted for weaving by rotary power; fig. 2, is an elevation of the same, taken at the right hand end; fig. 3, is a sectional elevation, taken transversely through the loom, looking toward the right hand end; and fig. 4, is a horizontal view of the loom as seen from above, in all which figures the same parts of the machine are pointed out by similar letters of reference. The main shaft *a*, receives rotary motion from any first mover through a strap *b*, applied to the pulley or rigger *c*, fixed upon the end of the main shaft, from which shaft all the working parts of the loom are driven.

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* A copy of the specification of this patent will be found in our present Series, vol. vi. p. 139.

The warp beam *d*, is mounted upon an axle, the ends of which turn in slots formed in brackets fixed to the back upright standards; and the periphery of this warp beam bears upon a roller *e*, which has a toothed wheel *f*, upon the end of its axle, and is driven round by means of an endless screw *g*; hence, the warp beam is made to revolve, and the warp given out by the friction of its surface against that of the roller *e*, below.

The yarns delivered from the warp beam pass upwards over the back rail *h*, and thence through the healds *i*, *i*, and the reed *k*, toward the breast beam *l*. The cloth being here woven, proceeds downward under a drawing roller *m*, and over the perch *n*, and thence to the cloth roll *o*, upon which it is progressively wound.

The healds *i*, *i*, are formed of bent wires, in a manner that will be described hereafter. The frames of these healds are affixed to boards or plates *p*, *p*, one of which is attached to a sliding guide rod *q*, and the other to two other guide rods *r*, *r*, and they are connected together by an endless strap *s*, *s*, which is made fast to the boards *p*, *p*, and passed over the tension pulleys *t*, *t*, mounted upon the side frames.

On the main shaft a cam *u*, is fixed, as shown at fig. 3, which works within a rectangular frame *v*, *v*; and as the main shaft revolves, causes the rod *q*, to slide up and down in its guides, and thereby to communicate a reciprocating motion to one of the boards or plates *p*, by which means the healds *i*, *i*, are made to move up and down for the purpose of opening and closing the sheds of the warp.

The pecking, that is, the projecting of the shuttle through the sheds of the warp, is produced by the following means:—From each end of the main shaft, arms *w*, extend, which, as they revolve, alternately act against the side of one of the levers *x*, *x*. This part of the apparatus, though partially shown at each end of the loom in the front elevation, fig. 1, is more perfectly seen in the detached fig. 5. The levers *x*, have their fulcrums upon studs fixed in the legs of the batten A, A; and as the main shaft *a*, revolves, the arms *w*, are alternately made to press with considerable force against the projecting cams or rollers *y*, *y*, in the levers *x*, and thereby to force back those levers into the position shown by dots in the last mentioned figure. The upper part of each lever *x*, acts against the shorter arm of a right-angled lever *z*, pendant from the upper part of each of the legs A, of the batten B; and by the movement just described, causes the lever *z*, to be thrown with considerable velocity into the position shown by dots. The longer arm of the lever *z*, being attached to a cord or strap, connected to arms extending downwards from the pecker C. These movements of the levers *x*, and *z*, cause the peckers to give those sharp strokes to the shuttle which are required for projecting it to and fro along the shuttle race between the sheds of warp.

There is a peculiarity in the pecker, viz. that it has a recess opposite to the end of the shuttle, filled with India-rubber, and which may be advanced as it wears away by means of a screw passed through from the opposite side.

The backward movement of the batten B, for allowing the shuttle with the weft to pass between the sheds of the warp, is effected by rotary cams D, D, upon the main shaft, as shown in fig. 2. These cams, as they revolve, act against the tails of jointed levers E, E, and when the longer radii of the cams are acting against the tails of those levers, the batten is kept back, as in fig. 2, which is during the time that the shuttle is passing through the yarn; but the moment that the tails of the levers E, escape from the larger radii of the cams D, the batten is released, and is forcibly drawn forward (for the purpose of beating up the shoot) by the power of a spring F, F, attached to the front standards, and to the legs of the batten (see fig. 3). This beating up of the shoot is assisted by the tappets G, G, upon arms extending from the main shaft, which, immediately after the batten has sprung forward, come in contact with an inclined plane H, on the back of each leg of the batten, and force it onward to such an extent as may be required for driving the weft-thread home.

It now remains for me to describe the means by which the yarns are given off from the yarn beam *d*, and the cloth taken up or wound upon the cloth beam *o*. A bar I, sliding freely in staples J, J, affixed to the stationary framework, (see fig. 2,) is, by the return or backward movement of the batten B, made to strike against the upper part of a cross-armed lever K, mounted upon an axle in a bracket fixed to the back standard, to one of the arms of which lever K, a pawle L, is affixed. This pawle takes into the teeth of a ratchet wheel M; and when the lever K, is acted upon as described, the pawle is forced forward into the teeth of the ratchet M, and the wheel necessarily advanced in its rotary movement one tooth. This slight movement of the wheel M, consequently produces a correspondent rotary movement of the axle and conical pulley N, N; and by a strap O, a similar movement is communicated to the lower pulley P, upon the axle of which is fixed a worm or endless screw *g*, Now, as this endless screw takes into the teeth of the wheel fixed upon the axle of the friction cylinder *e*, whatever quantity of movement is produced by the means just described will be given to the cylinder *e*; and the warp beam *d*, bearing upon its periphery, will, by the friction of the surfaces, be consequently made to turn upon its axis, and by these means, to give out the required length of warp yarns for the next taking up of the cloth.

A weighted cord, passed round a pulley fixed on the end of the beam *o*, causes that beam to turn and to wind up the cloth. A similar pulley and weighted cord is likewise applied to the end of the drawing roller *m*, by means of which the cloth is not only held in tension, but is gradually drawn down from the breast beam, and conducted over the perch *n*, to the cloth roller *o*. This drawing roller *m*, if properly weighted, will be the principal agent in bringing the cloth forward (as it is produced by the weaving), and the diameter of this roller remaining always the same, the tension or power of draught will be at all times uniform.

The rotary power of the drawing roller *m*, thus obtained, is communicated through its axle to the friction disc Q, fixed thereon, and is made the agent for raising the driving pawle L, in the following way:—When the batten comes forward for beating up the weft, a sliding rod R, connected to the lower part of the leg of the batten, is made to strike against the upper part of a right-angled lever S, seen best in fig. 2. The falling back of this lever S, as shown by dots, causes a lever T, mounted on the bottom rail of the standard, to be raised, which lever T, carries a vertical rod U. This vertical rod is connected at top by a joint to a sliding rod W, and at bottom by a joint to the lever T, where a friction roller V, is made fast to the lower end of the rod U. This roller V, is brought into contact with the periphery of the friction disc Q, by the rising of the lever T;

as described; and when these two surfaces thus come into contact, any rotary movement given to the disc by the means above described, will cause the roller v, to move, and with it the rod u. By these means the rod u, will be thrown into the position shown by dots, which will project the sliding rod w, against the lower arm of the cross lever k, and thereby raise the pawle l, that is, draw it back one tooth upon the periphery of the ratchet wheel m, placing the pawle in the proper situation preparatory to driving the ratchet wheel, the stroke for effecting which is given by the means before described. Thus it will be perceived that the delivery of the warp yarns is made contingent upon the winding up or drawing forward of the cloth by the roller *m*; for if the striking up of the reed against the work does not meet with sufficient resistance, owing to the want of weft thread, the force will be insufficient to drive the cloth over the breast beam *l*, consequently the drawing roller *m*, and the friction disc q, upon its axle, will remain quiescent, and the parts v, u, w, not being moved, the pawle l, cannot be drawn back; therefore, the ratchet wheel m, and the parts n, o, p, *g*, and *e*, connected with it, which drive the warp roller *d*, must remain at rest, and no warp will be given off.

As regards the improved mode of clothing the warp beam of a woollen loom, I should, by way of preface, say that by the ordinary methods of beaming, the coils of the yarns are laid upon the roll with great inequality, that is, the yarns are wound on in clusters, and with very different degrees of tension, to obviate which my present improvement is proposed. I take yarns from the warper, and pass them in the usual manner through close reeds, in clusters of about twenty yarns in each. As I wind these yarns upon the warp beam, I introduce between each winding a thickness of paper or other suitable material; this I effect by employing a sheet of paper, or other suitable material, of width equal to that of the yarns spread along the beam, and of an equal length to the entire length of the warp. From the roll so clothed I now draw off the yarns, separate them, and pass them through a reed as fine as that by which they are intended to be woven. Through this fine reed I then wind them again on to another beam, with a roll of paper, or other suitable material, between each winding, as before. The last mentioned beam, so covered with the warp yarns and paper, is then to be placed in the loom as at *d*, fig. 3, and the ends of the several yarns being passed through the weaving reed in the usual way, are drawn off the warp beam in the progress of weaving by the means above described. The sheet of paper or other material which intervenes between each winding of the warp is then simultaneously, with the delivery of the warp, conducted to a roller x, upon which it is wound by means of a weighted cord passed round a pulley at its end.

The peculiar construction of the healds for opening the warps is shown upon an enlarged scale detached from the machine at fig. 6.

Instead of having eyes or loops, as heretofore, for the warp yarns to pass through, my improved healds are formed of bent wires a, a, which, by their hooked ends, are attached to two horizontal bars b, b, connected to two standards of iron c, c, the latter of which are made fast to one of the plates or boards *p*, before described. The yarns severally are passed round the bend of the wire which retains it, and as the frame of healds move up and down, the sheds of warps open and close.

A variation in the construction of the healds is shown at fig. 7 (an edge view), and at fig. 8 (a front view). The healds in this case are of wire, but in the form shown at d, and their lower parts are made flat, as at e; which flat parts or stems are cast into leads f, in the same way as the guides of a lace-making machine. These leads are inserted in, or attached to the plate or board *p*, at bottom, and the wires are left open at top for the purpose of inserting the yarns between, and passing them round the bent part.

My improved construction of reed is formed of straight flattened wires, cast into leads as the guides of a lace-making machine, and shown in two views at figs. 9, and 10: g, g, are the wires, and h, the leads which are inserted into the batten i.

The apparatus which I employ as temples for keeping the cloth distended in width, is shown at k, in the detached figures 11, 12, 13, and 14. Fig. 11, is an enlarged representation of part of fig. 3, exhibiting the breast beam *l*, and the opening of the shed of warp; fig. 12, is a horizontal representation of the same; fig. 13, is a transverse section, taken between the breast beam and the part of the warp where the weaving is finished, that is, beaten up; and fig. 14, is a perspective view of the implement employed as the perpetual temple. This implement k, may be called a clutch, one of which is to be fastened upon the breast beam near each end. It has a narrow opening between a pair of chaps for the edge or selvage of the cloth to pass through. Behind these chaps a recess is formed, into which a slight rod of whalebone or other suitable elastic material m, is inserted loosely, the reverse end of which rod is fastened to the harness frame i. The rod, by these means, is made to move up and down with the shed of warp, and when the shuttle traverses, the weft yarn is carried over the rod, and thereby made to weave the cloth with a small loop beyond the list. As the cloth is driven forward over the breast beam, these loops slide a short distance upon the rod m, for the purpose of keeping the cloth distended to its proper width at the part where it is woven.

I have only to add, as respects the operation of weaving woollen cloths, that the arrangement of machinery for weaving may be worked either by power or by hand, and the peculiar construction of healds and of reed, as well as the perpetual temples and the mode of framing, as described, are not only applicable to the novel construction or arrangement of the parts of a loom as above set out, but also to other constructions of power looms and hand looms for weaving woollens.

As regards the dressing of the surface of woollen cloths, my improvements are represented in the accompanying drawings at figs. 15, and 16.

Fig. 15, is a longitudinal section of a machine in which the cloth, while distended by habitting hooks, is passed forward under a barrel or roller covered with teasles, wire cards, or brushes; fig. 16, is a horizontal or top view of the same. The piece of cloth to be dressed is placed in the scray below, from whence one of its ends is conducted between the rollers *a, b, c, d, e, f, g, h,* and from the last roller is allowed to fall down the inclined plane *i,* where the two ends of the piece of cloth are sewn together, forming it into an endless band.

The roller *a,* is mounted upon an axle in a trough of water, and covered with a felt; the axle of the roller *b,* is mounted in weighted levers, for the purpose of pressing the cloth against the surface of the felted roller, by which means the cloth will be made to take up a small quantity of water from the felt; the roller *c,* is a conductor of the cloth, and turns upon pivots in the ends of the top rail of the machine; the roller *d,* is mounted in lever arms, which hang upon pivots in the back standards, and is made to bear against the cloth in order to prevent it slipping forward.

Across the middle of the machine is placed the roller *e,* which is covered with teasles, or wire cards, or brushes, and its axle turns in bearings fixed on the top rail. Beneath the roller *e*, is placed the roller *f*, the axle of which is mounted in lever arms *k*, suspended upon the fulcrum rod *l*; the longer arms of these levers are weighted for the purpose of pressing the bed roller *f*, against the under surface of the roller *e*.

The roller *g*, is a drawing roller, upon the end of the axle of which the main driving pulley *m*, is fixed, and a pressing roller *h*, mounted in lever arms suspended from pivots on the back standards, bears against the surface of the drawing roller *g*, in order to hold the cloth tightly as it advances, and to conduct the cloth down to the inclined plane leading into the scray.

The cloth having been thus passed lengthwise between these rollers, it is extended in breadth by its lists being hooked on to a series of habits *n*, *n*, *n*, *n*, which slide on a horizontal rod *q*, on each side of the machine, as shown at fig. 16.

Rotary power being now applied to the driving pulley *m*, the roller *g*, will be made to draw the cloth progressively forward through the machine. A band passed round the rigger *o*, on the opposite end of the axle of the roller *g*, communicates motion to the pulley *p*, on the end of the roller *e*, and causes the roller *e*, to revolve with a greater speed than that at which the cloth travels, and in the same direction. By these means, as the cloth advances, the teasles, or wire cards, or brushes, act against the surface of the cloth, and produce the dress.

The habitting hooks *n*, *n*, *n*, adapted to this machine, are connected in series, in frames which slide upon horizontal bars of iron *q*, *q*, attached to the side rails of the wooden framework; and one of these frames of habits being placed upon the bars *q*, *q*, on each side at the back part of the machine, and the hooks made fast to the lists by the hands of attendants, the cloth, as it is drawn along, will cause the habitting frames to slide forward until they arrive at the front part of the machine, that is, where the cloth is let fall on to the inclined plane of the scray, when the lists are to be unhooked and the habit frames removed, to make way for those which are coming onward.

A friction lever or break *r*, may be applied to the roller *c*, when required to give additional tension to the cloth; and the pressure of the bed roller *f*, against the cloth under the teasle, card, or brushing roller *e*, may be regulated by sliding an adjustable hook *s*, which is intended to support the tail part of the lever *k*; and when this pressure is required to be removed altogether, the foot of an attendant may be placed upon the treadle lever *t*, which, through the connecting rod *u*, will cause the tail part of the lever to be raised, and the roller *f*, to be withdrawn from its contact.

I may here observe, that when it is not required to supply water to the cloth in this operation, I dispense with the rollers *a*, and *b*, and conduct the cloth from the scray immediately up to the rollers *c*, and *d*.

In order to clothe the dressing roller *e*, with teasles, I construct a series of slight frames of tin plate and wires, in the manner shown at figs. 17, 18, and 19. Fig. 17, represents the frame as seen sideways, and fig. 18, the same, as viewed at the back part. Between the four projecting horizontal wires I introduce a teasle as shown, from which the teasle, when its points are worn away on one side, may be readily withdrawn, and its position changed, in order to bring its fresh points into operation. A series of these teasle frames I attach to a flexible band, by passing the foot of each frame under staple wires, as in figs. 19, and 20, and then wind this band of teasles round the roller in the form of a screw.

If it should be considered eligible to form the teasle of larger diameter than that represented in the machine, I would then mount the teasles in handles, as shown at figs. 21, and 22, confining each teasle between wires in order to afford the opportunity of shifting them when required, and these handles may be attached to the barrel or roller in any convenient way; and also the same construction of teasle handles may be adapted for any other sort of gig machinery.

The last feature of my improvements in dressing cloth, being an addition to my former patent above mentioned (in which I dressed cloth in portions by distinct operations, by the application of pressure in connexion with heat and humidity), consists in the adaptation of a second process of pressing the cloths in portions, after that in which heat and humidity has been employed. This second process is for the purpose of abstracting the heat from the cloth whilst under pressure, which is effected by the following means:—

After pressing a portion of the cloth in the machine, as described in my former specification, I immediately pass that portion of cloth which has been just operated upon from the heated press into a cold one of a similar construction, placed contiguous to the former, the platten of which is formed hollow, and kept in a cold state by being filled with a quantity of cold water; and under this I submit the cloth to cold pressure. By these means, that portion of the cloth which had been made hot by the former operation of pressing, is now, whilst under the weight of the platten containing the cold water, reduced to a cold state, and thereby finished in a more perfect manner than when allowed to cool, as in the former instance.—[*Inrolled in the Rolls Chapel Office, August,* 1838.]

Specification drawn by Messrs. Newton and Berry.

To Thomas Oram, *of No.* 27, *East-street, Red Lion-square, in the county of Middlesex, gentleman, for his invention of improvements in the manufacture of fuel.*—[Sealed 26th March, 1838.]

The Patentee describes his invention in the following manner:—It is well known that in getting coal much small or dust is produced, which is of comparatively little value. Now, the object of my invention is the compounding such dust or small of coal with other matters, in such proportions as to render the compounds of as great, and, under some circumstances, of greater value than the large of such coal, when the relative quantity or effect obtained therefrom and the convenience of stowage is taken into account; and my invention consists in combining and compressing the small or dust of coal with certain materials into fuel, as will be hereafter described.

The materials employed by me are, first, small or dust of bituminous coal; secondly, mud, alluvial deposits, marl, clay, or any other earth containing vegetable matter; thirdly, water, and there are several other substances which may under certain circumstances be employed with the above three, but are not absolutely necessary to make a good fuel; such as mineral tar, coal tar, gas tar, mineral pitch, vegetable pitch, resin, asphaltum, or any other bituminous matter, chalk, or lime, sawdust, anthracite or stone, coal, coke, or coke dust and breeze; and in order to give the best information in my power for carrying out my invention, I will describe a process of combining and forming these materials into several species of fuel.

Take thirty pounds of vegetable tar, coal tar, gas tar, mineral pitch, vegetable pitch, resin, asphaltum, or any other bituminous matter. Note—The vegetable tar, coal tar, and gas tar, will readily mix with the other ingredients used; but if either mineral pitch, vegetable pitch, resin, asphaltum, or any other bituminous matter be employed, it should first be dissolved in boiling water, and whilst hot mixed with the other materials. One hundred and eighty pounds of dry mud (the best for the purpose is that taken from rivers), clay, marl, or any other earth containing vegetable matter, and fifty gallons of water, and mix them together; then add by degrees thirty pounds of powdered lime (stone lime is the best) or chalk, passed through a fine sieve, and one ton of small or dust of bituminous coal. The whole should then be well stirred up with rakes or other suitable instruments, until the several materials are thoroughly combined, or they may be mixed together by machinery, it being necessary to obtain a perfect blending of the materials in order to their adhering together and burning equally. The materials so combined are then to be put into moulds of any shape (although it is better that they should be either square, oblong, or angular), the dimensions of which may be of any size found most convenient, and then pressed either in a screw, lever, or other press. But I claim the combination as an invention, whether the same be submitted to pressure or not, the object and advantage of pressing being the holding of the materials together to increase the period and duration of combustion, and to reduce the bulk as much as practicable.

The lumps or blocks thus produced are to be placed to dry, leaving spaces between the lumps for the circulation of the air; and it will facilitate the drying to place them in a room or shed, the atmosphere of which can be heated, though in warm dry weather this will not be necessary.

I have also to describe another species of fuel, which forms a desirable fuel for use in furnaces, having a powerful draught. Take ten hundred weight of small or dust of bituminous coal, ten hundred weight of small oven-made coke or coke dust (which proportions will admit of variation), thirty pounds of tar or any other of the bituminous matters before specified, two hundred pounds of dry mud, clay, marl, or other earth containing vegetable matter, fifty gallons of water, and thirty pounds of lime or chalk, and mix, mould, and press them in precisely the same manner as described for manufacturing the first mentioned fuel.

I have also to describe a third species of fuel:—Take fifteen hundred weight of small or dust of bituminous coal, five hundred weight of breeze (which proportions will also admit of variation), thirty pounds of tar or any other of the bituminous matters before specified, two hundred pounds of dry clay, marl, mud, or other earth containing vegetable matter, fifty gallons of water, and thirty pounds of lime or chalk, mixed, moulded, and pressed in like manner.

I have also to describe a fourth species of fuel:—Take thirteen hundred weight of the anthracite or stone coal, seven hundred weight of small or dust of bituminous coal (which proportions will admit of considerable variation), forty gallons of water, forty pounds of tar or other bitumen, as before, thirty pounds of lime or chalk, and one hundred and eighty pounds of dry clay, mud, marl, or other earth containing vegetable matter, mixed, moulded, and pressed in like manner.

I have also to describe a fifth species of fuel:—Take fifteen hundred weight of small or dust of bituminous coal, five hundred weight of sawdust (which proportions will admit of considerable variation), forty pounds of tar or other bitumen, as before, two hundred pounds of dry clay, mud, marl, or other earth containing vegetable matter, seventy gallons of water (the quantity of water must be varied in proportion as the quantity of sawdust is used), thirty pounds of lime or chalk, mixed, moulded, and pressed in like manner.

I have also to describe a sixth species of fuel:—Take five hundred weight of peat turf, peat earth, peat moss, or bog earth, five hundred weight of sawdust, ten hundred weight of small or dust of bituminous coal, thirty pounds of lime or chalk, thirty pounds of tar or other bitumen, as before, two hundred pounds of dry clay, mud, marl, or other earth, containing vegetable matter, and seventy gallons of water, mixed, moulded, and pressed in like manner.

I would observe, that in manufacturing each of the above species of fuel, the ingredients lime and bitumen may be omitted; but I find that the use of them not only increases the adhesion of the other materials, but the lime has the effect of neutralizing the sulphurous acid gas contained in the coal, and the bitumen adds to the ready combustion of the fuel. And further, that I prefer the use of vegetable tar to any other bitumen, of mud (especially river mud, and more particularly such as is taken from the river Thames,) to any other earth, of stone lime to chalk, or any other description of lime, and the sawdust from the pine to the sawdust of any other description of timber.

Having thus described the nature of my invention, and the process of manufacture, I would remark that I do not confine myself to any particular process, it being evident that the object to be obtained is a careful combining or mixing of the materials herein mentioned, and the subsequent pressing the same into lumps or blocks of convenient size, and of the forms most advantageous for packing or stowage, and whatever process may be adopted it does not alter the nature of my invention.

And I would further observe, that I do not claim the application of each of the several materials separately as a fuel, whether pressed or unpressed, as I am aware that some of them have been used as a fuel before; such as anthracite or stone coal, coke, breeze, peat earth, peat turf, peat moss, or bog earth, small coal or coal dust, and small coal or coal dust, in combination with mud, marl, or clay, in certain proportions; but what I claim, is the combining small or dust of bituminous coal with marl, clay, mud, alluvial deposits, or other earth containing vegetable matter; and with water, in all cases where the weight or quantity of small coal or coal dust is equal to, or exceeds the weight or quantity of mud, clay, or other earth used, whether the same has or has not any one or more of the other matters herein mentioned.

And further, I claim the compressing of small coal or coal dust in combination with any of the above-mentioned matters into angular blocks or shapes, suitable for better stowage; but I do not claim as new, the application of tar, pitch, or other bitumen in combination with coal, or with any other of the matters, various attempts having been before made for employing them as fuel: nor do I confine myself to the using the whole, or even the larger number of the several matters before enumerated for the formation of the several descriptions of fuel above mentioned, though I believe the compounds herein severally set forth to be the best compounds for fuel.—[*Inrolled in the Inrolment Office, September*, 1838.]

To HENRY PERSHOUSE PARKES, *of Dudley, in the county of Worcester, iron-merchant, for his invention of improvements in flat pit chains.*—[Sealed 11th August, 1836.]

THIS invention consists in the application of certain iron stays to flat pit chains, by which the individual links thereof are stayed or supported, and are also combined together into one plane, as will be hereafter described. And in order that my invention may be more readily understood

I would observe that the flat pit chains ordinarily used for raising coals and other materials from pits and mines, have stays made of wood, fastened between every alternate set of links by a flat nail, which being driven through the wood stays, and rivetted, secures the same within the links. But there are many objections to these stays: for instance, the atmosphere effects the wood, and causes it to expand and shrink, by the same being damp or dry; and hence, the stays get out of place in the midst of working, and frequently the chain breaks in consequence thereof. Again, the rivet heads (which hold the wooden stays in the links of the chain), by continued friction against the sides of the pulley, wear away and fall out; and very often the chain becomes twisted, and otherwise thrown out of order: hence, rendering the necessity of constant repair, which is not only prejudicial in respect to expense, but the pitmen are prevented working during the time repairs are being made. Now, to obviate these difficulties, I make my stays of wrought iron, or other suitable metal, in the following manner:—

I take a bar of iron, and roll it into the form shown at fig. 23, Plate VII., from which I cut stays according to the size required, and then stamp out portions from the side, leaving it in the form fig. 24, which is a plan, and is shown endwise at fig. 26. Fig. 25, shows a piece of iron, with ribs or projections *b*, formed thereon by rolling or otherwise. These pieces of iron are for making those links of the chain where stays are employed, the projections *b*, being made for the purpose of fitting within the grooves of the stay. Care must be taken in making the ribs or projections *b*, that sufficient space be left to allow for the bending of the links as shown, the stay is placed between the links, the ribs, or projections *b*, fitting within the grooves *a*, of the stay, the links having the stay within them are then well hammered, and are thus caused firmly to bind the stay *a*, within the links; and although I recommend such projections *b*, to the links, it will be evident that the inner part of the link itself may lie within the groove *a*.

Fig. 27, shows a portion of the chain in a finished state. In all these figures the same letters refer to similar parts.

Having now described the nature of my invention, and the manner in which the same is to be performed, I would remark, that, although I have here shown only three links combined by their stay into one plane for making flat pit chains, other numbers may be used; and although I have recommended the making of the iron or other metal stays, by rolling bars into the form shown, I do not confine myself thereto; and I would have it understood that I do not confine myself to the precise form of stays herein shown, as variations may be made for effecting the object of my patent, without deviating from the principle of my invention: for instance, the grooved iron, fig. 23, may be used as a stay without removing the side piece, as shown in fig. 24; but I prefer the plan fig. 24, by which lightness may be obtained with the requisite strength: or a narrow piece of metal shown at fig. 28, grooved in the same manner as figs. 23, and 24, may be placed within the links; but I have found the plan first described to answer best.

And I would have it understood, that I lay no claim to the rolling of the iron, nor to the mode of preparing the stays, or to any of the parts separately. But what I do claim as my invention, is the application of wrought iron or other metal stays to flat pit chains, in such manner that the links where the stay is used shall be combined into one plane, and kept into their proper positions for forming a flat chain, whatever be the number of links used in the same plane; but I do not claim the application of iron stays to chain links, unless two or more be thereby combined into one plane.—[*Inrolled in the Inrolment Office, February,* 1837.]

To MICHAEL WHEELWRIGHT IVISON, *silk-spinner, in Hailes-street, Edinburgh, for his invention of an improved method of consuming smoke in furnaces and other places where fire is used, and for economizing fuel, and also for applying air heated or cold to blasting or smelting furnaces.*—[Sealed 24th February, 1838.]

THIS invention relates, first, to a mode of consuming smoke evolved from coal in furnaces, and other such places where coal fire is used by the application of steam above the ignited fuel, whereby not only the smoke will be consumed, but fuel saved, as a given quantity of coal will produce a much greater effect; and, secondly, my invention relates to a mode of applying air heated or cold, in combination with steam, to blasting or smelting furnaces. And in order to give the best information in my power, as to the nature of my invention, and the manner of performing the same, I will proceed to describe the drawing in Plate VIII., at fig. 15, which represents the section of a steam boiler and furnace, which, together with the description hereafter given, will be sufficient to enable a workman readily to carry out my invention generally, to various furnaces and other places where coal is burned for producing fire: *a*, are the ordinary fire bars, and *b*, the ash pit; *c*, being an ordinary high pressure steam boiler; *d*, is a tube passing from the steam boiler into the furnace, or from the steam cylinder, to conduct the steam which has performed on the piston; or the steam may be obtained from any convenient source, there being a steam cock *e*, by which the person attending the boiler can regulate the flow of steam into the furnace, in order to obtain the desired effects, and, on the one hand, prevent too much steam passing into the furnace, and, on the other hand, to allow of just sufficient to produce complete combustion, which will readily be judged of by observing the effects produced. At the end of the steam pipe *d*, which is spread out into a fan shape, there are a number of small holes perforated, in order that the steam may flow in minute jets in a direction downwards, by which means the smoke will be consumed, and fuel economized; and it is the introduction of steam on to the coal, which constitutes the first part of my invention.

At the same time I would remark, that although I prefer that the steam pipe should introduce the steam in a direction downwards from the front towards the back of the fire bars, as is shown, yet I do not confine myself thereto; as the steam may be introduced over the coal, on the fire bars, or in other directions, without departing from my invention; the object being to inject streams of steam amongst the smoke or products of combustion as evolved, and by mixing therewith, aided by the heat of the fuel and a sufficient supply of atmospheric air, the whole are consumed, and a more perfect combustion obtained.

I would remark, that I am aware steam has before been applied into the ash pits and through the bars of furnaces to improve combustion, and into the chimney or flue to increase the draft. I, therefore, do not claim the application of steam generally to furnaces, but only when applied according to the mode herein described. And, further, there are various well-known modes of applying heated air to furnaces, both above and below the fuel; and there are various means of obtaining such heated air to furnaces where coal is burned, for evaporating fluids, and for other purposes, such heated air being applied for the purpose of saving heat, and of improving the combustion of coal in furnaces, and to aid in consuming smoke evolved by the coal in the act of combustion. I mention these, because my invention is equally applicable to furnaces suitably constructed for having heated air applied to them, as to furnaces supplied with air direct from the atmosphere, without previous heating, care being observed, that whatever be the furnace or place where the fire is used, and having my invention applied thereto, that there is a free supply of atmospheric air.

I will now proceed to describe the second part of my invention, which relates to a mode of applying air heated or cold in combination with steam, and for heating such air to blasting or smelting furnaces. It is well known, that according to the present manufacture of iron, heated air is now becoming very generally employed; and the cold air of the atmosphere is either drawn through iron surfaces heated directly by a fire, such heated air being then supplied or forced into the furnace by suitable means or blowing machines; but the most general mode of obtaining what is called hot blast, is by tubes heated on the external surfaces by the direct action of a fire, and the cold air is applied by means of blowing machines forcing cold air through the heated tubes, whereby the air becomes highly heated by the time it comes into the furnace. But according to all the plans practised, there is such heating to the metal surface against which the air impinges, as materially, to alter the moisture and character of the air heated by them; and it is well known that the atmospheric air employed in blasting, differs in the result produced at different seasons of the year.

Now the object of the second part of my invention, is the application of air, whether heated or cold, in combination for steam and for heating air, for blasting and smelting purposes, by the intermediate aid of hot water or steam, or other suitable fluid, whereby three advantages are derived. First, the heat of the metal, though it heats the air to the degree required, will not prejudicially change the same. Secondly, by this means, the heat of the air applied may be regulated to the degree of temperature required. Third, the pipes or metal surfaces will not be so quickly destroyed.

In order to carry out this part of my invention, I employ a vessel or steam boiler; I prefer it to be of a cylindrical form with hemispherical ends, similar to ordinary, high-pressure steam-engine boilers, fixed with suitable furnace: through this steam boiler, I insert a coil of tubes, or other suitable metal surfaces, and apply suitable means for keeping a constant supply of water in the boiler; and, further, there is to be a safety valve, by which, as it is well understood, the pressure, and consequent degree of heat in the boiler, may be maintained to a degree slightly above the degree of temperature to which the air is required to be heated: but it will be evident that other arrangements of apparatus to use steam or hot water, or other fluid for heating suitable furnaces, may be resorted to, which would, in fact, be only a variation of what is herein described. I do not, therefore, confine myself to the precise form of the apparatus used, provided steam, or hot water, or other fluid be employed to heat suitable surfaces, against which air is caused to pass, in order to be heated for blasting or smelting purposes: and in order to apply such apparatus for heating air for blasting furnaces, I use it in one or two ways, either by placing such heating apparatus in a suitable position, in respect to a pump or other blowing machine, that atmospheric air may, in the working of the blowing machine, pass through the heating apparatus, and thus enter into the blowing machine in a heated state, and be applied or driven into the furnace thereby; or otherwise, I place the heating apparatus between the blowing machine, of whatever kind employed, and the furnace, to be blasted, whereby the cold air is applied by the blowing machine through the heating apparatus, and thus obtain a hot blast to the furnace. In using steam for improving the quality of the heated or cold air, and for economizing fuel used in blast or smelting furnaces, the same is to be introduced into the twyre with the blast of air, or by a separate tube or tubes; and I have found that in using steam, that the quantity of water in the form of steam may be beneficially used by employing a quantity of steam equal to about one part by weight of water in the form of steam, to one part by weight of suitable fuel used; and the steam I have employed, has been from eight pounds to thirty-five pounds pressure to the square inch: and so far as I am enabled to test the result, I believe it desirable to use steam of moderate pressure, in preference to high pressures; but I do not confine myself to any particular pressure of steam, nor to the relative quantities of steam and fuel here stated.

Having thus described the nature of my invention, and the manner in which the same is to be performed, I would wish it to be understood that what I claim as my improved method of consuming smoke and economizing fuel in furnaces where coal is burned, is the mode of applying steam, whether in conjunction with hot air or otherwise, as above described; and, secondly, I claim the mode of applying air, whether hot or cold, in combination with steam and heating air for blasting or smelting furnaces, as herein described.—[*Inrolled in the Inrolment Office, August,* 1838.]

To THOMAS JOYCE, *of Camberwell New-road, in the county of Surrey, gardener, for his invention of improved apparatus for heating churches, warehouses, shops, factories, hothouses, carriages, and other places requiring artificial heat, and improved fuel to be used therewith.*—[Sealed 16th December, 1837.]

THE Patentee describes his invention in the following words:—My invention of improved apparatus for heating churches, warehouses, shops, factories, hothouses, carriages, and other places requiring artificial heat, consists in peculiar constructions of stoves, in which I am enabled to regulate the combustion of the fuel, and produce any required degree of temperature in the places in which they are situate; and my improved fuel to be used therewith is a peculiar preparation of charcoal, chemically treated for the purpose of purifying it.

The internal and external forms and constructions of these stoves will admit of some slight modifications; but the leading feature to be observed is, that the apertures for the admission of atmospheric air at bottom, to support the combustion of the fuel, must be limited as to size, and that the apertures at top for the egress of the vapour arising from the ignited charcoal must be capable of adjustment, in order to regulate the combustion within; whilst the tubes or channels for the passage of the atmospheric air intended to be heated and dispersed around, may be varied in an indefinite number of forms and directions, according to circumstances or taste: for the essential improvement in the construction of the stoves is the means of regulating the combustion of the fuel, so that no more than a given quantity of it can be consumed in a given time, and that the quantity of heat evolved may be in like manner regulated.

The most simple construction of my improved stove is shown in Plate VIII., at fig. 1, which represents a plain cylindrical stove, taken in section vertically through the middle; and fig. 2, is an external view of the same.

The cylindrical sides of the stove *a, a,* are, in this instance, made of sheet iron; the bottom *b,* of cast iron; a moveable lid *c,* fits into the top of the cylinder, in which there is a sliding regulator *d,* having apertures in the same manner as an ordinary adjustable air valve. In a circular opening in the bottom *b,* there is inserted an inverted cone *e,* which has a few small holes pierced through for the passage of the atmospheric air into the lower part of the interior of the cylinder; or small air holes pierced through the bottom, or round the lower part of the cylinder, might be employed in addition to, or as a substitution for, the perforated cone. A circular rim *f, f,* below, having many apertures, may form the foot of the stove, or it may stand upon three or more feet.

Fig. 3, represents an external elevation of a stove upon the same construction, but rendered sufficiently ornamental to be suited to a parlour or other well-furnished room. Fig. 4, is a section of the same. This may be made of iron, brass, or copper, or partly of each. The cone *e,* pierced with a few small holes, is inserted in the bottom of the stove, as before; and through it passes the atmospheric air to support combustion, which air is conducted by a tube *g,* in the pedestal of the claw-foot; and lateral apertures may be made for a further supply of air, if required, through the sides of the cylinder, at *z, z.* The sliding valve *d,* at top, for regulating the draft, is inserted into the upper part of a dome cover *c,* and may be readily raised or depressed, in order to open or close the vent or aperture through which the vapours arising from the combustion are discharged; which vapours being inodorous, are allowed to pass into the room, and to aid the heat thrown off by radiation from the external surface.

A stove constructed as figs. 1, and 2, may be introduced within a case, either of a plain or ornamental form, as in the section fig. 5, which represents a cylindrical jacket or outer case *h*, *h*, placed round the stove. The jacket forms an air passage *j*, *j*, partially open at *x*, *x*, in the bottom, and the air, in proceeding through it, becomes heated, and is allowed to escape at top by the openings in the dome with the vapour arising from the combustion, and thence falls into the surrounding atmosphere of the room, and warms it. The outer casing may be of any ornamental form, as that of an urn or a hollow figure; for the shapes of the air passages are of very little importance, provided the combustion of the fuel in the stove be properly regulated in the way described.

Another modification of the invention consists of air tubes passed through the ignited fuel within the stoves, for the purpose of carrying off a portion of the heat produced by radiation. Fig. 6, shows an external elevation of such a stove, and fig. 7, a section of the same, exhibiting the arrangement of the hot air tubes within, and in which the air for supporting combustion is admitted through the inverted cone *e*, at the bottom, and through small apertures *x*, *x*, in the lower parts of the sides of the stoves, if required, the draft being regulated by the adjustable slide valve *d*, at top.

The air admitted up the central tube *g*, in the pedestal, supplies both the combustion of the fuel and also the hot air tubes *i*, *i*, *i*, and outer passage *j*, *j*. In passing through these tubes *i*, *i*, *i*, the air takes up the heat radiated from their internal surface, and delivers the air so heated through apertures in the jacket, without mixing with the vapour arising from the combustion; but the air which passes up the outer passage *j*, *j*, proceeds into the dome cap of the casing, from whence it ultimately escapes with the vapour of the combustion through openings in the cap, and also warms the surrounding atmosphere of the place in which the stove is situated. Fig. 8, represents a horizontal section of the stove within its casing, taken about halfway down; fig. 9, is a top view of the stove, the cap being removed to show the interior. In this instance I have introduced a vessel, shown in section at *k*, in fig. 7, which contains water. I place this vessel upon the top of the stove, for the purpose of moistening the heated air by the slow evaporation of the water.

In very close apartments, such as sleeping rooms, if any inconvenience should be apprehended from the effects of the vapour evolved during combustion, I would, in such case, recommend a very small pipe to be attached to the top of the stove, for the purpose of enclosing the valve in the manner shown at fig. 10, or in any other convenient manner for carrying off the vapour, which pipe might be led through the wainscot or wooden partition of the room into a passage, or through a window or chimney, or the wall, or other convenient outlet; and in that event I should have a slide valve under the stove, for regulating the admission of air to support the combustion, or the regulating valve might be in the pipe. The heat in that case would be obtained entirely by radiation; but in general where the rooms are not air tight, this precaution will be altogether unnecessary; for if any vapour that might be considered offensive should be given out from the combustion of the prepared charcoal in these improved stoves, the quantity will be so very small, as to be incapable of doing any injury.

In using either of these stoves, I, in the first instance, ignite a small quantity of my prepared fuel, which may be so ignited by filling an iron ladle with the fuel, and introducing it into an ordinary fire. When the fuel has become red hot, I put it into the stove, and then fill the stove above the ignited fuel with other of my said prepared fuel, in a cold state. The valve being now opened at the top of the stove, the combustion will go on slowly and regularly, and continue for many hours without any attention whatever, the fresh fuel descending gradually by its own weight as that below becomes consumed, the inverted cone preventing the air passages from being stopped up by any accumulation of ashes or dust, and likewise preventing any of the dust, ashes, or hot fuel from falling out, and becoming either dangerous or offensive.

The partial opening or closing of the valve at top, as before said, will determine and regulate the rapidity of the combustion of the fuel in the stove, and consequently the quantity of heat evolved; and when the combustion has been allowed to continue for a certain length of time, a fresh supply of the said fuel may be introduced, and the operation continued; but to do this the dust and ashes should be removed, which may be done by inverting the stove, when other fuel may be ignited and introduced as before. If the stove is of large dimensions, I should have an open grating at the bottom, through which the dust and ashes might fall into a close air-tight box attached to the under part.

Having now described the features of my improved apparatus for heating, which forms one part of my invention, I proceed to explain the other part of my invention, which consists in preparing ordinary charcoal made or charred from wood (oak and beech being preferred). This process of preparation I effect by submitting the ordinary charcoal to a red heat, and by wetting the said charcoal with solutions of caustic or carbonated alkalies, or alkaline earths or their salts, either before or after such heating process. I prefer the addition of these substances after the charcoal has been reburnt. When I wet the charcoal before reburning it, I immerse or saturate the same in a solution of carbonate of soda, or other of the aforesaid alkalies, or alkaline earths or their salts, in the proportion of about three pounds of carbonate of soda, or equivalent proportions of the other aforesaid alkalies or salts, to twelve gallons of water. I do not confine myself strictly to these quantities, as the proportions may vary according to the quality and nature of the soda or other alkali, or alkaline earths or their salts, used, or to the nature and quality of the water; for water, if very hard, will require a greater quantity of one of those substances. The alkali that I have generally used is either the caustic soda of commerce, or the crystallized carbonate of soda; but I have found other alkalies, and especially lime, as above stated, to answer.

After the charcoal has been so saturated, or partly prepared, it is allowed to drain until nearly or quite dry, when it must be burnt in a furnace. If the charcoal has not been wetted with the alkaline solution before reburning, I take it from the furnace and wet it, in the progress of cooling, with the solution made in the same proportions as above described. It must, of course, be allowed to drain and become dry before it is used in the stove.

The furnace which is to be employed in reburning the charcoal, as aforesaid, may be of ordinary construction, furnished with a damper to regulate the draught; but the one which I employ is constructed partly in the fashion of a baker's oven, and is particularly described by the sectional figures 11, and 12, represented in the drawings annexed. When the charcoal introduced into this oven has become perfectly red hot through, the damper is to be slidden into the flue in order to prevent its further combustion, and the charcoal may then be withdrawn from the furnace into air-tight boxes or vessels called coolers, where it is to remain excluded from the atmospheric air until it is cold, when it will be ready for use, or to be put up for sale.

I desire it to be understood that I do not confine myself to any particular dimensions of stoves, as they may be varied from the size of a quart pot (which would be suited for warming a close carriage) to any dimension that might be required, for heating churches and other large buildings: neither do I confine myself to regulating the combustion of the fuel by a moveable valve at top, as such a regulating apparatus might be applied at bottom of the stove, or might be employed both at top and bottom.

But I claim as my invention, the combination of parts or materials for regulating and limiting the draft of air in my improved apparatus, as above described, being well adapted for the purposes of forming stoves; I also claim as my invention, the combination above described, by which I form an improved fuel as a substance to be burnt in stoves; I also claim as my invention, the whole combination of improved apparatus and improved fuel for warming or heating places, by which the improved fuel can be used to great advantage in the improved apparatus, &c.—[*Inrolled in the Rolls Chapel Office, June,* 1837.]

Specification drawn by Messrs. Newton and Berry.

To JOSHUA BATES, *of Bishopsgate-street, in the city of London, merchant, for an invention of certain improvements in machinery for cleaning and preparing wool, being a communication from a foreigner residing abroad.* —[Sealed 16th April, 1836.]

THESE improvements in machinery for cleaning and preparing wool, consist in a novel improved construction and arrangement of machinery or apparatus, by means of which the burrs or seeds of wild plants, small pieces of vegetable matter, dirt, or other foreign materials, mixed or mingled with certain descriptions of wool, can be removed therefrom, and, at the same time, the fibres of the wool are partially prepared or combed and laid straight, and delivered from the machine in the form of a sliver or layer of wool, fit for the further operations of combing and preparing for spinning; and which improved machinery or apparatus is more particularly applicable to cleaning and combing of South American wool, or wool from other countries where the flocks of sheep, during a greater part of the year, are allowed to range in almost a wild state in the forests or uncleared lands, whereby the burrs or seeds of plants, or other foreign material which adhere to the fleece of the sheep, become so entangled and intermingled with the wool as it grows, that it requires considerable trouble to clean the wool therefrom by hand, after the shearing.

In this improved machinery or apparatus, the wool to be operated upon is placed upon a feeding cloth, and drawn from thence between two or more rollers, and is presented from them in a gradual and nearly uniform and regular manner, to the action of a cylinder covered with elastic wire teeth or cards, or strong bristles, or mixtures thereof. And as this cylinder revolves at a greater speed than the feeding or delivering rollers, the fibres of the wool are taken hold of by the teeth of the cylinder, and are partially drawn out or combed straight, the fibres of the wool passing into and between the elastic teeth or wire cards, while the burrs, seeds of plants, bits of wood, or other extraneous matters, are pushed from out of the fibres of the wool by the ends of the teeth or wire cards, and presented on the surface thereof, the teeth being placed sufficiently close together to prevent the foreign matters entering between them, whereby the burrs, seeds of plants, and other matters are exposed to the action of a rapidly-revolving beater, fan, or brusher, placed very near to, or slightly in contact with, the periphery of the cylinder; the burrs, seeds of plants, and other extraneous matters being arrested in their progress with the cylinder by a ledger blade, so placed and adjusted to the periphery of the cylinder, and to the fan or beater or brusher, that the seeds, burrs, or other matters, are stopped thereby on the surface of the cylinder, and presented to the action of the beater or brusher, which immediately knocks, pulls, or brushes them off, and removes them from the wool without injuring or breaking, or cutting its fibres, which is protected by the elastic teeth or wire cards as the wool lies in between them, the elastic or card teeth yielding to any extraordinary pressure in the operation. The wool passing round with the teeth of the cylinder, is taken therefrom by the action of another drum or cylinder covered with card teeth, similar to that of a common carding engine, from whence the wool is taken off in the form of a continuous sliver, by means of a doffer roller and doffing comb in the usual manner of carding engines; or it may be removed by rollers or cylinders covered with comb teeth or needle points, which will take hold of the fibres of the wool and draw them out of the cylinder; or the wool may be removed in any other convenient manner.

And in order that this novel and improved construction of apparatus may be better understood, I have hereunto annexed several figures or drawings of one of these machines, although I do not mean or intend to confine myself to the precise arrangement there shown, as there are many parts of the same which may be varied to suit different kinds or qualities of wool, or different speeds of working, the novel feature, as before stated, consisting in protecting the fibres of the wool by the elastic teeth of wire cards, or other fit and proper material, while the burrs, seeds of plants, and other extraneous matters are being removed therefrom by the actions of a rapidly-revolving fan, beater, or brusher, and the stationary ledger blade, the burrs and other extraneous matters being pushed out of the wool by the teeth of the cylinder, and exposed to the actions of the beater or brusher and its ledger blade.

Plate VIII., fig. 13, is a front end view; and fig. 14, is a longitudinal vertical section taken through the same; similar letters of reference being marked on corresponding parts in all the figures: *a, a,* is the framework and standards of the machine; *b,* the endless feeding cloth passed over the rollers in the usual matter, and actuated from any convenient moving part, and at the requisite speed, according to the rate the wool requires to be fed into the machine. Upon this feeding cloth, the wool in its rough or uncleaned state is spread out evenly by hand, and in proper thicknesses or quantities, according to the foulness of the wool and speed at which the machine is working; *c,* is a receiving roller armed with wire teeth, which take the wool from the feeding cloth, and delivers it to the cylinder *d,* when the operation of removing the burrs and other matters take place, the roller *c,* being assisted in that operation by the other rollers *e, e,* also armed with wire teeth, and mounted in adjustable bearings, which partially loosen or open the fibres of the wool, and prepare it for the operation of the rapidly-revolving fan, or beater, or brusher, *f,* which is mounted in adjustable bearings, to regulate its distance from the cylinder; *g,* is the ledger blade, which arrests or stops the burrs or other foreign matters on the surface of the cylinder, and presents them to the operation of the beater, and is adjustable to the cylinder and the fan or beater by the set screws *h*; *i,* is a larger drum or cylinder, covered with card teeth, which receives the wool from the cylinder *d*, and, carrying it round, deposits it on to the doffer cylinder *k*, from whence it is removed, in the form of a continuous sliver, by the doffer or comb *l*, acted upon by a spring in the usual manner, the wool being partially raised out of the cards of cylinder *i*, by the teeth of the cylinder *m*, in order to assist this operation.

It will be seen, that as the wool is delivered from the roller *c*, to the cylinder *d*, the teeth of the latter take hold of the fibres, and partially comb them straight, and carry them round past the fan or beater *f*, which, revolving in the direction of the arrows, strikes, beats, or brushes off the burrs and other matters arrested on the surface of the cylinder *d*, by the stationary ledger blade *g*, the teeth of the cylinder being elastic, giving way to any extraordinary pressure of the fan or beater.

I would here remark, that the fan or beater, in this instance, is composed of metal by several helical or projecting ribs or blades, coiled round it in a similar manner to the ordinary rotatory cutters of a cloth shearing machine, the helical ribs and the ledger blade forming what may be called a continuous pair of pincers; but this fan or beater may be composed of rows of strong bristles, whalebone, wire points, or teeth, or ribs of wood, or any other material, according to the quality of wool or any other material: also that, from the same circumstances, the teeth of the cylinder *d*, may be of any suitable substance and form, so as to be elastic, and protect the fibres of the wool in such a manner as not to allow the fan or beater cutting or breaking them. And further, the ledger blade may be made elastic, if thought desirable; therefore, I do not intend to confine myself to any precise materials.

It will be seen, by inspection of the drawings, that the various rollers and cylinders, and other parts, are put in motion in a somewhat similar manner to those of a common carding engine, the machine receiving its motion from a strap passed from the steam engine or first mover to the pulley or rigger *n*, on the shaft or axle of the drum *i*. The cylinders *d*, and *m*, and the crank *o*, of the doffer being actuated by a strap *p*, *p*, passed round the drum *q*, also mounted on the shaft of the drum *i*, and that the fan or beater is worked by a band *r*, from the rigger *s*, placed at the end of the drum *i*, the rollers *c*, and *e*, together with the feeding cloth *b*, being moved by toothed gear, set in motion by the rigger *u*, by a band passed over the rigger *v*, turning on a fixed pin or stud, and actuated by a pinion in its hollow axis the spur wheel *w*, mounted on the end of the axle of the upper roller *e*; the doffer cylinder being actuated by the band passed from the rigger *x*, and over another rigger which gives motion through a pinion to the toothed wheel *z*, on the end of the axle of the cylinder.

In conclusion, I would remark, that the above-described apparatus for removing burrs, seeds of plants, pieces of vegetable materials, and other extraneous or foreign matters from wool, may be adapted and put into operation in various ways; for instance, it may be connected as to a carding or combing engine, the wool being fed thereto from the doffer *z*, and passed once through the various after processes of combing and preparing, or sorting, for spinning: or it may be connected with the card cylinder of a common carding engine, and the ledger blade and fan or beater brought to act upon the card teeth of that cylinder or drum, instead of using a separate cylinder, all of which may be found practicable, and answer the purpose; therefore, I do not intend to confine myself to the application of the said apparatus in a separate machine, but claim as this invention the removing the burrs, seeds of plants, pieces of wood, or other foreign matters fixed or commingled with wool, from the surface of any kind of teeth, or wire cards, or brushes, or a mixture thereof, by means of the ledger blade, and revolving fan, beater, or brusher, as above described.—[*Inrolled in the Rolls Chapel Office, October,* 1836.]

Specification drawn by Messrs. Newton and Berry.

To JEAN BAPTISTE PLENEY, *of Panton-square, in the county of Middlesex, brick-maker, for certain improved machinery for manufacturing articles out of brick and other the like earth, being a communication from a foreigner residing abroad.*—[Sealed 22d October, 1834.]

THE Patentee, in his specification, divides his invention into two parts; the first of which consists in an apparatus for compressing, or kneading, and moulding the brick or other earth, when it has been properly mixed with clay soil, or such other suitable ingredients as are required to form the material out of which bricks are generally made, and which, when so amalgamated, the Patentee, in his specification, calls brick earth. The second part of the invention consists in an apparatus for trimming and cutting the brick earth (after it has been kneaded and compressed in the manner hereinafter described) into lengths as may be required, according to the nature of the article intended to be manufactured.

The first part of the invention is shown at fig. 16, Plate VIII., which represents a longitudinal section taken through the middle of the machine: *a, a, a,* is the framework or supports of the apparatus; *b, b,* is a travelling bed or plank carrying the brick earth; this plank is carried forwards by means of an endless rack or frame, consisting of a number of pieces or blocks of wood nailed or otherwise fastened on to a travelling endless belt or band made of leather or other suitable material: this travelling endless rack or frame is supported by rollers *c, c, c,* having their bearings in the framework of the apparatus; *d,* is a large pressing cylinder, for the purpose of reducing the shapeless mass of clay shown at *e,* on the bed or plank *b,* to something like a flat and even surface. This cylinder is furnished with a doffer, consisting of a piece of wire stretching transversely across the machine; the object of this doffer being to clear the cylinder of any clay or brick earth that might otherwise adhere to it as it revolves. The end rollers of the set *c, c, c,* which carries the endless rack, are furnished with teeth or pegs, which take into the rack or catch against the projecting ends of the rack pins, and thus cause the endless rack to be propelled forward; and one of the end rollers is mounted in a slot made in the framework, so as to be capable of adjustment by means of a screw, when it may be considered necessary to tighten or loosen the leather band of which the endless rack is constructed; *f, f,* are carrying rollers for supporting the bed or plank upon which the clay is placed, these rollers being also mounted in the framework of the machine; *g,* and *h,* are two small adjustable compressing cylinders, which finish the moulding and kneading process after it has been commenced, and partially done by the larger cylinder. On each side of the plank or bed are placed cutters, for cutting or trimming off any of the clay or brick earth that may extend beyond the edges of the said plank.

It will now be understood that the earth, after passing through the above-described machine, comes out in a long narrow sheet of the thickness of a brick, the width of the long layer being the length of a brick. The brick earth of the shape required is, when finished, carried from this machine by an inclined plane or otherwise, to a machine or apparatus called, by the Patentee, the cutting machine, and is intended for cutting the continuous layer of brick earth, as made in the kneading and moulding apparatus, into pieces of the form of a brick: this machine, however, may, if required, be attached directly to the kneading and moulding apparatus, and be incorporated with it; but the Patentee states that it is preferable that they should be distinct, for the convenience of stowage when not in use.

The Patentee here commences the description of the cutting apparatus; but it is described in such a vague and unsatisfactory manner, that we are rather at a loss to understand the construction of the machine, or the Patentee's meaning. We will, however, give our readers as good a description of the apparatus as the specification allows us.

The Patentee says, that having kneaded the clay or brick earth, and compressed it to the thickness required for a brick, in one long layer, it is carried forward into the machine and subjected to the action of a frame, having wires extended horizontally across it: this frame is mounted on hinges fixed to the side framing of the apparatus, and the wires that are extended across it are weighted at one end by being passed over pulleys, and a weight being attached to the end of each; but how these said wires are to be caused to cut through the clay when brought down, as the Patentee describes it, by a lever intended for that purpose, does not exactly appear. The frame is raised and lowered by means of a lever, as before stated, one end of which is attached to the opposite end of the frame to which the hinges are fastened. This lever is mounted on a fulcrum, situated very near to the cutting frame, and the reverse end is raised by the workman, and by that means the cutting frame is forced down; and it is supposed that the wires will cut through the clay, and form it into the shape and size of a brick. The frame being again raised, the bricks thus formed will be moved forward, and are afterwards dried and burnt in the usual manner.

The Patentee has shown an inclined plane mounted on rollers, which he intends to use for the purpose of conveying the bricks to any distance, where they may be required to be dried or burnt.

If, instead of bricks, the machine may be required to make jambs for chimney or mantel-pieces, or mouldings of any kind, the rack or bed must be made of the width required for the work, and the smaller compressing rollers may be grooved or indented with the moulding or running pattern required, only one wire being used in the cutting frame for cutting the layer of earth into such lengths as may be required, according to the article to be manufactured. And it may be here observed, that, if for the finer sort of work it may be deemed desirable to give an extra smoothness to the surfaces of the article, this may be done by allowing a small quantity of water to trickle over the brick earth in front of a smoothing board, fixed in such a manner to the framework of the machine, that as the brick earth is carried forward, it will be met and made smooth by the board under which it passes.

The Patentee says, in conclusion, that it is evident that various articles may be manufactured of brick earth by means of the aforesaid improved machinery, such as bricks, flat tiles, jambs, mantel-pieces, and mouldings, which may all be made on a plain flat bed, such as the plank or bed here shown; whilst pantiles, and a variety of other articles, can only be made by having the bed or plank formed as a matrix or mould, and the smaller compressing rollers made of the shape required: he, therefore, claims as the invention, secured to him by the present Letters Patent, firstly, the compressing and moulding apparatus with the bed, endless rack with the compressing or kneading and moulding rollers; and secondly, the cutting or dividing frame, together with the apparatus for trimming or scraping the clay on the bed as it passes to the dividing or cutting frame; and also, the mode of carrying the brick and bed, by means of the inclined plane, to be dried.—[*Inrolled in the Inrolment Office, April,* 1835.]

To GODFREY WOONE, *of Berkeley-street, Piccadilly, in the county of Middlesex, gentleman, for his invention of an improved method of forming plates with raised surfaces thereon, for printing impressions on different substances.* —[Sealed 12th June, 1837.]

THIS invention is described by the Patentee as consisting in an improved mode or method of forming moulds or matrices from which casts are to be taken in metal, or other suitable substances which may be found capable of receiving a sharp and well-defined impression, such casts having on their surface the relief of the design, pattern, engraving, or writing which is intended to be printed or impressed on calico, paper, silk, leather, woollens, or other substances or fabrics on which impressions are now commonly taken from blocks, plates, or cylinders with *raised* figures, designs, or engravings which are produced thereon by means of engraving, cutting, stamping, etching, or otherwise lowering the parts or interstices between the work intended to be left in relief, or from stereotype plates obtained from such original blocks, cylinders, or plates.

The Patentee now proceeds to describe in what manner he makes the moulds. They are obtained in the following manner, according to the nature of the design, pattern, or engraving which it may be desirous of obtaining in relief. For the finer patterns used in calico and other printing, or for paper staining, or for such engravings as are usually cut in box-wood, and printed at a common type press, the following method is made use of:—Take plaster of Paris and white lead in different proportions—say about two parts of white lead to one part of plaster of Paris. These two ingredients are then to be mixed together with water, until they arrive at about the consistence of cream. This mixture or composition is then to be poured out upon a smooth, well-polished, and perfectly even plate or block of metal or other hard substance of the size required. The depth of the composition, of course, will always be regulated by the height of the relief required.

For work to be printed at the common type printing-press in the manner of wood engravings, the thickness of the layer or composition need not exceed the twentieth part of an inch; but for coarser designs or patterns, as for calico printing, the thickness of the composition ought to be increased to about the eighth part of an inch.

The metal plate or block, after it has been covered with the above composition, should be left to dry gradually, or it may be baked until it is perfectly dry; and in order to give this coating or composition a more perfect, smooth, and even surface, and obtain the required thickness or height with greater nicety and exactness, the coating or composition should be laid on the plate or block thicker than what may be intended to be worked upon. The surface of the coating or composition when perfectly dry, may be then scraped off or smoothed down to the required thickness with a piece of metal which has a perfectly true and even edge. The pattern or design is then traced on to the surface of the composition or coating, in the same manner as is now generally employed among engravers or artists. The workman or designer must then proceed to engrave, etch, scratch, or draw with a steel point, or other suitable instrument or apparatus, all the lines or parts of the design through the composition or coating down to the metal block or other substance on which the composition or coating is laid.

The Patentee now proceeds to describe the second manner which he has employed for forming the moulds or matrices, and which he describes as being preferable for the coarser and rougher patterns, and may be used for making colouring blocks used in calico and other printing.

This method may also be applied to making the moulds or matrices for the finer work, but, perhaps, will not be found to answer the purpose so well as the first described method.

The manner in which he makes these moulds is as follows:—A piece of metal, pasteboard, stone, wood, or composition of plaster of Paris, of the height of the intended relief, is glued, or otherwise fixed on a block of metal, wood, or other suitable material: the artist or designer must then cut, engrave, or etch with acid in the usual manner employed by engravers, either the outline or the entire pattern or design. When the outline only has been cut, engraved, or etched, it will be necessary to remove or cut out those parts of the wood, composition, metal, or other substance which is to form the matrix or mould, that are within the outline of the design or pattern, in order to form a perfect matrix or mould of the pattern or design to be obtained in relief. If it should be found necessary to use acid in making this mould in metal, stone, &c., the plate of metal or stone should be fixed upon a block of wood, pasteboard, or other substance that is not liable to be corroded by the acid used for biting in the mould of the pattern or design.

The Patentee here observes, that in order to obtain a perfectly clear impression from the casts to be obtained from these moulds, it is necessary that some parts should be lowered or depressed, in order that those parts may not receive the printing ink or colour which is applied to the relief for obtaining the impression, and by that means produce a blurred and imperfect impression on the paper, calico, or other substance to be printed on. In order to do this, the cast must be taken from the mould immediately after it is finished by the methods above described, and the workman must then proceed to finish it ready for receiving the ink or colour, in the usual manner employed by wood engravers; that is, by cutting, scooping, engraving, and lowering those parts of the cast which, in consequence of the distance between the edges of some parts of the design from the edges of another part, require to be deeper than the rest of the design. Or the following method may be made use of:—After the whole of the pattern, design, or engraving has been cut, etched, or engraved through the composition made of white lead and plaster of Paris, or through the wood, metal, or other substance intended to be used for that purpose, then the workman may lay or fix with any suitable instrument, any quantity of modeller's clay, or other fine earth, or composition which will answer the purpose, and may be deemed desirable, upon those parts of the design or pattern which may require to be heightened for the purpose of obtaining a corresponding depression on the cast or impression to be taken from it; care being taken, however, that the design or pattern which has been drawn, cut, or executed on the mould or composition, is not interfered with or injured in any way. Or the matter or substance used for heightening those parts of the mould which require such a process, may be laid on in the following manner:—chalk, white lead, or any other similar substance mixed with water, as thick as can be conveniently laid on with a brush, may be used; and this composition is applied to those parts of the mould which require to be rased. When this last-mentioned mixture is to be applied to the layer or composition of white lead and plaster of Paris, the mould of the pattern or design which is drawn on the plate and composition, must be first slightly and carefully oiled; and in order to prepare the moulds for the operation of casting, they must always be perfectly dried: this may be done by allowing them to dry gradually, or by baking them, if that mode be preferred. The moulds or matrices may also be manufactured from papier maché, or other substances now in use for obtaining casts of fine wax for ornamental or other purposes, by means of stamping, casting, or moulding: metal may also be employed, and, in fact, any substance may be used which is capable of being cast, stamped, or moulded, and receiving a sharp and clear impression from the mould, and which, at the same time, is sufficiently hard for the purposes of printing.

The Patentee here states, that as there is no novelty in the method of obtaining casts from the moulds, he does not consider it necessary to describe the process of casting, stamping, or moulding, as all the processes may be carried on in the usual manner, as is at present employed in fine casting, and is well known to practical men, and those acquainted with this branch of the arts. But for casting the finer work, such as wood engravings, the Patentee prefers the method that is now generally made use of in the process of stereotyping or casting from moulds, taking in plaster of Paris from original wood engravings; and he likewise makes use of the same composition and metal which is used for that purpose.

Another method of making casts, is by placing the mould in any convenient box or form which is adapted for the purpose, and pouring suitable metal into the mould, pattern, or design; and the back of the plate is to be turned even in a lathe, and fixed upon a block of wood in the same manner as stereotype plates are mounted, that are taken from wood engravings or letter press.

The Patentee says, in conclusion, that when the plates or reliefs are to be applied to cylinders, the metal or substance on which the mould is formed should have a circular or curved form, corresponding with the circumference of the cylinder, on which the plate, or metal, or relief is intended to be fixed; or the plate may be cast level, and the circular form required may be given by pressure.—[*Inrolled in the Inrolment Office, December,* 1837.]

To KEITH NORMAN THOMSON, *of Holland-street, Blackfriars, in the county of Surrey, cork-manufacturer, for his invention of certain improvements in machinery for cutting or making corks or bungs.*—[Sealed 23d August, 1834.]

THIS invention is described by the Patentee as an improvement upon a patent granted to Sarah Thomson, in the year 1819, for improvements in machinery for cutting corks and bungs.

The Patentee of the present invention does not propose to make any material alteration in the construction of the machine patented in 1819, but confines his claim to what he calls the gauging apparatus: but in order that this may be clearly understood, it will be necessary to describe some of the old parts of the machine, in order that our readers may more easily comprehend the intentions of the Patentee.

The machine which he has described consists of a rotary cutter made of a thin disc or steel, revolving in bearings made in the framework, and the cork properly cut out into oblong pieces, as when corks are intended to be made by hand, is mounted in a revolving frame, called by the Patentee a kreel. As the kreel slowly revolves on its centre, by means of an endless screw gearing into a wheel mounted on its shaft, the cork is brought into contact with the rotary cutter, which slices off the edges, and forms a properly manufactured cork.

It must now be understood, that this frame or kreel which holds the corks is mounted upon a perpendicular axle, and that the blocks of cork to be cut are suspended between two clamps, with pins formed in them to hold the cork tight.

The clamps or holders are attached to the ends of spindles mounted in the revolving frame or kreel; and on the lower end of the under clamp or holder is mounted a small pinion, taking into gear with a small-toothed wheel, mounted on another axle, and actuated by an endless screw which is fixed on the main shaft of the machine.

Now, it must be evident that if the block of cork is not suspended exactly between the centres of the upper and lower clamps, that when the cork is brought forward to be acted upon by the rotary cutter, a larger quantity will be sliced off one side of the cork than the other; and consequently, a considerable loss will be sustained by the manufacturer.

The object of the Patentee is to prevent this loss, without the necessity of being over careful, and thereby losing much time in the adjustment of the block of cork between the clamps previous to subjecting it to the action of the rotary cutter. This is done by fixing two pieces of metal at right angles to each other, near the clamps or holders, and in the exact situation where the cork is intended to come; so that when it is necessary to supply a new piece of cork, the workman has only to place the square block in the angle formed by these two pieces of metal, and screw the clamps down upon it.—[*Inrolled in the Inrolment Office, February,* 1835.]

SCIENTIFIC NOTICES.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from p. 115.)

April 10, 1838.

Joshua Field, V.P., in the chair.

On the Application of Bickford's Fuzes to Blasting under Water.

By C. W. Pasley, Col. R. E., Hon. M. Inst. C. E.

The improvement in blasting under water which forms the subject of the above paper was first adopted at the Royal Engineer Establishment at Chatham, under the direction of the author, in the autumn of 1834.

Great advantage in blasting under water is derived from the use of Bickford's fuzes applied to tin powder cases; also from the new system of tamping by means of small stones, and of fixing ring-bolts in stones or rocks, introduced by Mr. Howe. But the ordinary Bickford fuze, though superior to every other in shoal water, cannot be altogether depended on in depths of from five to ten fathoms. The general practice has hitherto been to ignite the powder contained in a tin canister, by dropping a piece of red-hot iron down a tin tube reaching to the surface. The tin tubes being liable to failures, Colonel Pasley has used flexible leaden pipes, and a piece of port-fire instead of red-hot iron for vertical explosions. Several other means of firing—as small rockets, a quick-match, and small linen hoses—were tried, but without any great success.

A small fine powder hose, about one-eighth of an inch in diameter, secured so as to burn gradually instead of rushing forward and exploding, was found to succeed very well, but is neither so simple nor so cheap as the Bickford fuzes. These fuzes consist of so minute a thread of fine powder, that they burn rather than explode, and are in no danger of bursting the case, which is made of twisted hemp, coated with pitch, and so performs the double duty both of the hose and the metallic tube. The fuzes having been ignited, are thrown on the water, and generate a small column of elastic gas as they burn. Colonel Pasley then details several instances of the successful application of these fuzes, and proceeds to describe the general arrangements which were adopted by him, the fitting up of the tin cases, the mode of firing, the best borers for blasting under water, and a form of plug-bolt peculiarly adapted for mooring and warping up rapids.

The fuze is inserted through the cork of the tin case, upon which is placed an iron cone, having a small groove at the side of the base to admit the fuze, and the hole filled up to the top with small pieces of hard stone of about three quarters of an inch in diameter, as tamping. The plug-bolt, which is 3 feet long, and 1⅝ of an inch in diameter, having about four inches of the bottom end spread out into a cone or base, has about three inches inserted into a hole cut a little oblique towards the current, and fixed in the same manner by pieces of stone.

The Bickford fuzes, as ordinarily made, were found several times to fail in ten fathom water, and some larger ones burst the envelope, so that Colonel Pasley is of opinion that, in deep water, some other means should be resorted to. Also, when a large quantity of powder is to be fired, the time which the fuze is burning,—namely, about half an hour in eight fathom water—keeps the experimenter in a great state of uncertainty as to when the fuze has ceased to burn, the small air-bubbles sent up to the surface being generally imperceptible, except at a very small distance. In these cases, the small hose and leaden pipe are preferable.

The various kinds of tamping employed having been discussed, Mr. Macneill stated that he considered the tamping with sand to consume more powder, but to effect a great saving in time; it was also attended with less danger. He had found considerable advantage result from mixing a small portion of roach lime with the powder.

Colonel Pasley found, from his experiments, that tamping with small stones produced the same effect as a double charge of powder, when the tamping was sand. He had also tried equal portions of powder and sawdust, and the effect of a given quantity of powder in throwing a shell was somewhat increased by the presence of the sawdust—not, however, to such an extent as to induce them to trouble themselves with this additional article.

April 24, 1838.

JOSHUA FIELD, V. P., in the chair.

On Firing Blasts under Water by Galvanism. By John Bethell, Assoc. Inst. C. E.

Mr. Bethell's attention was directed to this subject in 1834, when engaged in experiments with his new diving-dresses. It is frequently necessary to blow off the upper decks of a wreck, so as to get at the cargo; but great difficulty has arisen in igniting the powder. A fuze of cotton, steeped in spirits of wine and gunpowder, and enclosed in a caoutchouc tube, was at first used; this, however, being uncertain and expensive, the idea occurred of trying galvanism.

It is well known that when two ends of copper wires leading from the poles of the battery are connected by a piece of platinum, or iron wire, the latter becomes red-hot. To apply this method, the top of the tin canister, which contains the charge, is fitted with two copper wires, about six inches long, passing through a piece of cork, and connected at their lower ends by a piece of platinum, or iron wire. The canister being charged, the platinum, or iron wire, is pushed down into the middle of the charge, and the top of the canister cemented on with putty. The wires are well coated with a non-conducting medium, as a mixture of resin, wax, and tallow, or caoutchouc, excepting at their lower end, where they are connected by the platinum, and at the upper, where they are to be connected with the two long copper wires which proceed to the battery. These connecting wires, covered with cotton thread, are coated with the caoutchouc varnish, and then tied together so as to form one rope; the diver having connected the wires of this rope with the wires of the canister, and uncoiled a sufficient length of rope, descends and deposits the canister in the wreck, or hole, prepared for the blast, and returns to the surface. The other ends of the wire are then dipped in the mercury cups of the galvanic battery, and the platinum wire becoming instantly red-hot, the charge is exploded. There is not more than about six inches of the wire rope lost at each discharge.

The security, certainty, and convenience, of this plan are evident. In quarries, any number of charges could be fired at the same instant, or in rapid succession; and this method possesses incalculable advantages over every other for the military engineer, since any number of mines could be exploded at the precise moment that is desired.

On the Limestone, the Lime Cement, and method of Blasting, in the neighbourhood of Plymouth. By W. Stuart, M. Inst. C. E.

Plymouth abounds in limestone, which may be raised in solid masses of from three to ten tons; it is used most extensively for building and for lime manure. About 13 cubic feet weigh a ton; the limestone is of a light blue or grey colour, in general free from metallic veins, but with some indications of manganese and ironstone, round pieces of the latter being found in clay beds, intermixed with the rock, and a vein of ironstone four inches thick at the surface of the rock, and dipping towards the south, has been opened.

The author then proceeds to describe the general method of making cement in that neighbourhood, and the method which he has employed with considerable advantage.

The bit or iron rod, called a jumper, is generally used. In pitching a deep hole, a 2-inch bit is used for about four feet, and a 1⅞-inch for the next four feet, by one man; then two men are employed with 1¾-inch to the depth of 14 feet, and 1⅝-inch to the depth of 21 feet. A constant supply of water is required during boring the hole. The hole being well dried, about one-third is filled with powder, say 15 lbs.; a needle is introduced as far as possible without driving it; the hole is tamped with dry clay to the top, and then covered with a little wet clay, to prevent any of the loose particles falling in when the needle is withdrawn. A reed filled with powder, and split at the top, to prevent its falling to the bottom of the hole, is inserted, and a stone laid upon it; the powder being ignited by a piece of touch-paper and a train, the reed flies to the bottom of the hole, and ignites the main load. The rock is generally cracked and loosened to a considerable extent, if not thrown; in that case, the needle is driven through the tamping, and such a fresh charge is run through thnee dle-hole as may be requisite. From six to eight tons of rock are generally blasted with one cwt. of gunpowder. The paper is ccompanied with drawings of the jumpers, the tamping bar, the needle, and the discharging reed.

Account of the Pont-Y-Tu-Prydd, over the Taâf, Glamorganshire. By Thomas M. Smith.

In 1746, William Edwards undertook to build a bridge over the Taâf; the first, which consisted of three arches, was carried away by a flood; the second, of the same dimensions as the present, fell from the too great load on the haunches. Before commencing the work again, Edwards is said to have consulted Smeaton, and either from the advice of that distinguished man, or from his own experience, he left in each of the haunches three cylindrical openings, from face to face, and it is said that the intermediate spaces are filled up with charcoal. The bridge was finished in 1750. The arch measures 140 feet betwixt the abutments, and has a curved line of 35 feet. The width of the soffit is 15 feet 10 inches at the springing, and 14 feet 5 inches at the crown; the width of the roadway at the crown being 11 feet.

On some Operations in Blasting in the Jumna, and at Delhi. By George Tremenheere, Lieut. Bengal Engineers, Assoc. Inst. C. E.

In this paper, the author gives an account of the charges of powder, andthe mode of tamping in blasting, under his direction, during the years 1828 and 1829, for improving the navigation of the Jumna, and from the years 1831 to 1835, at the fortification of Delhi. The jumpers were 6 feet long, and 2¼ inches in diameter; the blasts 5 feet deep, and at a distance of 4 feet from each other. The rate of boring varied from 2½ to 5 feet per day's work for two men. A double-headed jumper was used, to render the hole completely circular for the reception of the canister, about 2½ feet in length, and 2 inches in diameter, and filled two-thirds with powder and the rest with sand. The small tube reaching to the surface of the water contained quick-match, with a piece of slow-match at the extremity. The canister, well greased, was placed in the hole without any additional tamping. The method of removing the masses and the tools employed are described and explained by drawings.

At Delhi, the blasting was in dry rock, and economy of gunpowder being of more importance than economy of time, tamping was resorted to. For this a stiff red clay, slightly moistened, was employed, and the tamping bar was of wood, and the priming wire of copper. Any dampness which might exist in the bore was obviated by a tube of coarse paper, greased on the outside. Fine mealed powder was used as priming, and a piece of portfire for ignition. If the firing did not succeed, a fresh priming hole was bored in the tamping, or the mine abandoned. In large irregular masses of rock, the depth of the bore, or the intervals between the blasts, will generally represent the line of least resistance, and the following results were obtained in the rock at Delhi, which is hard quartz.

The line of least resistance not exceeding one foot, a charge of 2 oz. is sufficient; the line not exceeding 4 feet, and the rock not being highly crystalline, 3 oz. per foot will be sufficient.

The charges will vary with the tenacity of the rock, but the following may be a general guide:—the line of least resistance being 1, 2, 3, 4, 5, 6 feet, the charge will be 4, 8, 14, 20, 26, 36 ounces.

The author is of opinion, that notwithstanding the increased expenditure of gunpowder when sand is used as a substitute for tamping, the saving of time and labour is such as may, under some circumstances, counterbalance that disadvantage. This is stated to have occurred on the Jumna, where, owing to the rise of the river during the periodical rains, it was required to execute the greatest possible quantity of work with large bodies of men in a given time.

SCIENTIFIC ADJUDICATION.

Extension of Patent for Bodmer's Cotton-spinning Machinery, under Lord Brougham's Act, Clause IV., before the Judicial Committee of the Privy Council: present, Lords Brougham, Erskine, Langdale, Baron Parke, Dr. Lushington, and Sir H. Jenner.—Nov. 29, 1838.

We stop the press to give a brief notice of this case, the subject being one of considerable interest in the cotton manufactories, and of no small importance to patentees in general.

The patentee made his application in May last, for a prolongation of his patents in England, Scotland, and Ireland, notice of which was duly advertised, according to law. Caveats were in July entered against the prolongation of the patents, in the names of Nicholson and of Smith; and when the subject came before the Privy Council, 17th August, it was found that if sufficient time (one month, according to the rule) was granted to the opposing party, to prepare their evidence and models, the Council would then have closed its sittings for the session. The subject was thereupon merely opened and adjourned until 29th Nov.

On again opening the case, this day, (29th Nov.) it appeared that both the opposing parties had withdrawn their opposition; but the terms of the patents having, in the mean time, expired in October, the Council considered that they, or the Crown, had no power to grant new letters patent for matters which are now open to public use.

Considerable discussion took place as to the proper construction to be put upon the words of the Act—"Provided that no such extension shall be granted, if the application by petition shall not be made and prosecuted with *effect*, before the expiration of the term originally granted in such letters patent." Lord Brougham held that though the expression was rather ambiguous, yet it clearly implied that something must have been effected, some conclusion arrived at by the Council before the expiration of the patent; but as no conclusion had been arrived at, nothing effected, therefore the law did not empower the Council to proceed with the matter further.

His Lordship said that the Committee greatly regretted the situation in which the applicant stood, that it was quite clear a malicious and groundless opposition (as in the present case, for it had been withdrawn) might effect, by such indirect means, that which it could not accomplish by open, fair argument; and (he spoke with great warmth) much censure he considered was merited for such conduct, from which it was beyond the power of that Court to relieve the applicant.—His Lordship, however, threw out the suggestion, that the Parliament had still the same power of prolonging the patent; and we understand that upon this suggestion it is intended to act on the opening of the next session.

List of Patents

Granted in Scotland between 22d October and 22d November, 1838.

To Edwin Bottomley, of Aldermanbury, Yorkshire, clothier, for a certain improvement or improvements applicable to power and hand looms.—29th October.

— Lawrence Heyworth, of Yew Tree, near Liverpool, merchant, for a new method of applying steam power directly to the periphery of the movement wheel, for purposes of locomotion both on land and water, and for propelling machinery.—29th October.

— Thomas Evans, of the Dowlas Iron-works, Glamorganshire, agent, for an improved rail for railway purposes, together with the mode of manufacturing and fastening down the same.—31st October.

— Pierre Armand, Le Comte de Fontainemoreau, of Charles-street, City-road, London, for certain improvements in wool-combing, being a communication from a foreigner residing abroad.—2nd November.

— James Milne, of Edinburgh, brass-founder, for an improvement or improvements in apparatus employed in transmitting gas, for the purpose of light and heat.—6th November.

To John Henfrey, of Weymouth-terrace, London, engineer, for certain improvements in the manufacture of hinges or joints, and in the machinery employed therein.—6th November.

— Charles Flude, of Liverpool, chemist, for improvements in applying heat for smelting, or otherwise working ores, metals, and earths, and for heating steam boilers, and for general manufacturing, or other useful purposes where heat is required, and also for an improved mode of supplying hot water to steam boilers, the said improvements having economy for their object.—6th November.

— Christopher Nickels, of York-road, Lambeth, manufacturer, for improvements in machinery for covering fibres, applicable in the manufacture of braid and other fabrics.—7th November.

— Thomas French Berney, of Martin Hall, in the county of Norfolk, for certain improvements in cartridges.—8th Nov.

— Michael Wheelwright Ivison, silk-spinner, 19, Gilmore-place, Edinburgh, for an improved method for preparing and spinning silk, waste, wool, flax, and other fibrous substances, and for discharging the gum from silks raw and manufactured.—9th Nov.

— Moses Poole, of Lincoln's Inn, a communication from a foreigner residing abroad, for improvements in apparatus or machinery for obtaining rotary motion.—14th November.

— Thomas Mellodew, of Wallshaw Cottage, Oldham, mechanic, for certain improvements in looms for weaving various kinds of cloth.—14th November.

— Christopher Binks, of Newington, Edinburghshire, chemist, for certain improvements on the process or processes for obtaining or manufacturing certain substances or compounds, applicable in bleeching, and for rendering useful certain products which result therefrom; also improvements in the apparatus employed therein, and in bleaching, and for the application thereto of a certain agent, not hitherto so employed, which improvements are also in whole or in part applicable to other uses.—15th November.

New Patents

SEALED IN ENGLAND.

1838.

To Paul Chappe, of Manchester, spinner and manufacturer, for his invention of certain improvements in the means of consuming smoke, and thereby economising fuel and heat in steam engine and other furnaces or fire-places. —Sealed 31st October—6 months for inrolment.

To Luke Hebert, of No. 12, Staples-inn, in the city of London, civil engineer and mechanical draftsman, for certain apparatus and processes for storing, cleansing, and preserving grain.—Sealed 3d November—6 months for inrolment.

To Abraham Bury, Esq., of Manchester, for his invention of certain improvements in the mode of printing, colouring, or dyeing cotton or other fabrics, and in the mode of producing certain acid or acids applicable to these or other purposes.—Sealed 3d November—6 months for inrolment.

To Jacob Fitton Slade, of Carburton-street, in the county of Middlesex, gentleman, for his invention of certain improvements in pumps for liquids or aeriform fluids.—Sealed 3d November—6 months for inrolment.

To Joseph Fraser, of Halifax, in the county of York, railway contractor, for his invention of certain improvements in the apparatus or machinery to be employed on centerings or supporters in the construction of bridges and arches, and in tunnels or other mining operations.—Sealed 3d November—6 months for inrolment.

To Horace Cory, of Narrow-street, Limehouse, bachelor of medicine, for his invention of improvements in the manufacture of white lead.—Sealed 3d November.—6 months for inrolment.

To Charles Callis Baron Western, of Rivenhall, in the county of Essex, for his invention of an improvement in drills for the purpose of drilling corn, grain, seeds, pulse, and manure.—Sealed 3d November—6 months for inrolment.

To William Morgan, of New-cross, in the county of Surrey, gentleman, for his invention of improvements in the generation of steam.—Sealed 3d November—6 months for inrolment.

To Adolphus Henri Erneste Ragon, of Great Portland-street, in the county of Middlesex, professor of literature, for improvements in the manufacture of glass, and in the production of other vitrified matters applicable to architectural purposes.—Sealed 3d November—6 months for inrolment.

To Edward Cooper, of Piccadilly, in the county of Middlesex, stationer, for improvements in the manufacture of paper, being a communication from a foreigner residing abroad.—Sealed 3d November—6 months for inrolment.

To Charles Flude, of Liverpool, chemist, for his invention of improvements in applying heat for generating steam, and for general manufacturing and other useful purposes where heat is required; and also for an improved mode of supplying steam boilers with hot water, the said improvements having for their object the economy of steam.—Sealed 3d November—6 months for inrolment.

To Jerome Deville, of Crutched-friars, in the city of London, coach builder, for his invention of improvements in railroads and in carriages used thereon.—Sealed 3d November—6 months for inrolment.

To James Berington, of Charles-place, Shoreditch, veterinary surgeon of cavalry, for his invention of improvements in knapsacks.—Sealed 3d November—6 months for inrolment.

To William Henry James, late of Birmingham, but now of Lambeth, in the county of Surrey, civil engineer, for his invention of improvements in apparatus for heating, generating, and cooling fluids, and in engines to be actuated by such fluids, parts of which improvements are applicable to the raising and forcing fluids.—Sealed 6th November—6 months for inrolment.

To Robert Beart, of Godmanchester, in the county of Huntingdon, miller, for his invention of improvements in apparatus for filtering liquids.—Sealed 6th November—6 months for inrolment.

To Luke Hebert, of Bristol-road, Birmingham, in the county of Warwick, civil engineer, for a new or improved process or processes for embalming the dead, and for preserving corpses for anatomical purposes, being a communication from a foreigner residing abroad.—Sealed 6th November—6 months for inrolment.

To Moses Poole, of Lincoln's-inn, gentleman, for improvements in apparatus or machinery for obtaining rotatory motion, being a communication from a foreigner residing abroad.—Sealed 8th November—6 months for inrolment.

To John Juches, of Shropshire, gentleman, for his invention of improvements in steam-engine boilers, and in apparatus for feeding furnaces and fire-places, and for the more effectual combustion of the smoke and gasses arising therefrom.—Sealed 8th November—6 months for inrolment.

To Bryan J'Anson, Bromwich, of Clifton-on-Teme, in the county of Worcester, gentleman, for his invention of improvements in machinery to be worked by the application of the expansive force of air, or other elastic fluids, to obtain motive power.—Sealed 8th November—6 months for inrolment.

To John Small, of Old Jewry, in the city of London, merchant, for improvements in filtering liquids, being a communication from a foreigner residing abroad.—Sealed 8th November—6 months for inrolment.

To Henry Huntley Mohun, of the Regent's-park, M.D., for his invention of improvements in the composition and manufacture of fuel, and in furnaces for the consumption of such and other kinds of fuel.—Sealed 8th November—6 months for inrolment.

To Thomas Mayos Woodyatt, of Cookly, in the county of Worcester, screw manufacturer, and Samuel Harrison, of Birmingham, for their invention of improvements in the manufacture of wood screws.—Sealed 8th November—2 months for inrolment.

To John Browne, of Castle-street, Oxford-street, Esq., for his invention of improvements in paving roads and streets.—Sealed 8th November—6 months for inrolment.

To Felix Macartan, of St. Martin's-lane, in the county of Middlesex, gentleman, for his invention of improvements in treating the waste matters resulting from the washing of wool and woollen fabrics.—Sealed 8th November—6 months for inrolment.

To William Watson, jun., of Leeds, manufacturing chemist, for certain improvements in the manufacture of materials used in the dyeing of blue and other colours.—Sealed 8th November—6 months for inrolment.

To John Winrow, of Gunthorpe, in the county of Nottingham, mechanic, for his invention of certain improved means of, and apparatus for, destroying weeds and insects on land.—Sealed 8th November—6 months for inrolment.

To James Drew, of Manchester, civil engineer, for his invention of certain improvements in the means of consuming smoke and economising fuel in steam engine or other furnaces or fire-places.—Sealed 8th November—6 months for inrolment.

To Hugh Ford Bacon, of Fen Drayton, clerk, for his invention of an improvement or improvements in the construction of the glass holders and glass chimneys of gas burners.—Sealed 10th November—6 months for inrolment.

To John Holmes, of St. John's-terrace, Worcester, engineer, for his invention of improvements in forming moulds for casting in metal, studs, buttons, nails, tacks, and a variety of other articles.—Sealed 13th November—6 months for inrolment.

To George Smith, of the Navy Club-house, Bond-street, a captain in the Royal Navy, for his invention of certain improvements in vessels to be propelled by steam or other power, and in the construction and arrangement of the machinery for propelling.—Sealed 13th November—6 months for inrolment.

To Anne Bird Byerly, of 147, Strand, widow, and James Collier, of the same place, civil engineer, for their invention of certain improvements in obtaining motive power.—Sealed 13th November—6 months for inrolment.

To Sally Thompson, of North-place, Gray's Inn-road, for her invention of certain additions to locks or fastenings for doors of buildings and of cabinets, and for drawers, chests, and other receptacles, for the purpose of affording greater security against intrusion by means of keys improperly obtained.—Sealed 13th November—6 months for inrolment.

To Edward Samuell, of Liverpool, merchant, for his invention of improvements in the manufacture of soda.—Sealed 13th November—6 months for inrolment.

To Joseph Eden Macdowall, of 257, High-street, in the borough of Southwark, watch-maker, for his invention of an improvement in the manufacture of escapements for chronometers, clocks, and watches.—Sealed 15th November—6 months for inrolment.

To Thomas Trench Berney, of Morton-hall, Norfolk, Esq., for his invention of certain improvements in cartridges.—Sealed 15th November—6 months for inrolment.

To William Thorp and Thomas Meakin, of Manchester, silk-manufacturers, for certain improvements in looms for weaving, and also a new description of fabric to be produced or woven therein.—Sealed 20th November—6 months for inrolment.

To William Watson, jun., of Leeds, manufacturing chemist, for certain improvements in the manufacture of liquid ammonia, by which the same may be made applicable to the purposes of dyeing, scouring, and other manufacturing processes.—Sealed 20th November—6 months for inrolment.

To Harrison Grey Dyar, of Mortimer-street, Cavendish-square, gentleman, for his invention of improvements in the manufacturing zinc.—Sealed 20th November—6 months for inrolment.

To John Wilson, of Liverpool, lecturer on chemistry, for his invention of certain improvements in the process of manufacturing alkali from common salt.—Sealed 22d November—6 months for inrolment.

To Fauquet Delarue, jun., late of Deville, near Rouen, in the kingdom of France, but now of Manchester, calico-printer, for his invention of certain improvements in the process of printing, or otherwise applying and fixing the colouring matter of madder upon cotton, silk, linen, and other fabrics, without dyeing, and producing by these means permanent colours.—Sealed 22d November—6 months for inrolment.

To John George Bodmer, of Manchester, engineer, for his invention of certain improvements in machinery, tools, or apparatus for cutting, planing, turning, drilling, and rolling metals and other substances.—Sealed 22d November—6 months for inrolment.

To Abraham Cohen, of Islington, Esq., for his invention of certain improvements in the construction of railway carriages, and in the modes of connecting and retarding railway trains.—Sealed 26th November—6 months for inrolment.

CELESTIAL PHENOMENA, FOR DECEMBER, 1838.

D.	H.	M.	
1			Clock after the sun, 10m. 47s.
	—		☽ rises 3h. 22m. A.
	—		☽ passes mer. morn.
	—		☽ sets 8h. 4m. M.
			Encke's Comet R. A. 16h. 5m. dec. 4. 53. S.
			Ditto passes mer. 23h. 21m.
	11	34	Ecliptic oppo. or ○ full moon.
5			Clock after the sun, 9m. 12s.
	—		☽ rises 7h. 50m. A.
	—		☽ passes mer. 3h. 16m. M.
	—		☽ sets 11h. 42m. M.
			Encke's Comet R. A. 16h. 1m. dec. 9. 31. S.
			Ditto passes mer.
6	5	17	☿ greatest hel. lat. S.
7	16	20	♃'s first satt. will im.
8	10	56	☽ in □ or last quarter.
	12	19	♂ in conj. with the ☽ diff. of dec. 1. 10. N.
	19	19	♂ in □ with the sun.
10			Clock after the sun, 7m. 1s.
	—		☽ rises 0h. 44m. M.
	—		☽ passes mer. 6h. 54m. M.
	—		☽ sets 0h. 48m. A.
			Encke's Comet R. A. 16h. 0m. dec. 14. 32. S.
			Ditto passes mer. 22h. 41m.
	6	0	☽ in Apogee.
	16	59	♃'s third satt. will em.
	22	14	♃ in conj. with the ☽ diff. of dec. 2. 44. N.
11	2	19	♀ in the descending node.
14	18	13	♃'s first satt. will im.
	23	45	♄ in conj. with the ☽ diff. of dec. 6. 23. N.
15			Clock after the sun, 4m. 40s.
	—		☽ rises 6h. 51m. M.
	—		☽ passes mer. 10h. 32m. M.
	—		☽ sets 2h. 5m. A.
			Encke's Comet R. A. 16h. 8m. dec. 18. 59. S.
			Ditto passes mer. 22h. 30m.
	—		Mercury R. A. 18h. 58m. dec. 24. 46. S.
	—		Venus R. A. 17h. 27m. dec. 23. 24. S.
	—		Mars R. A. 11h. 25m. dec. 6. 25. N.
	—		Vesta R. A. 6h. 47m. dec. 21. 11. N.
	—		Juno R. A. 19h. 17m. dec. 14. 8. S.
	—		Pallas R. A. 12h. 27m. dec. 8. 52. S.
	—		Ceres R. A. 12h. 53m. dec. 5. 19. N.
15			Jupiter R. A. 12h. 57m. dec. 4. 49. S.
	—		Saturn R. A. 16h. 9m. dec. 19. 13. S.
	—		Georg. R. A. 22h. 43m. dec. 8. 58. S.
	—		Mercury passes mer. 1h. 23m.
	—		Venus passes mer. 23h. 53m.
	—		Mars passes mer. 17h. 48m.
	—		Jupiter passes mer. 19h. 20m.
	—		Saturn passes mer. 22h. 31m.
16	12		♀ in conj. with the ☽ diff. of dec. 4. 46. N.
17	0	23	Ecliptic conj. or ● new moon.
	9	4	☿ greatest elong. 20. 10. E.
	18	6	♃'s third satt. will em.
	20	56	♃'s third satt. will im.
18	2	15	☿ in sup. conj. with the sun.
	3	6	☿ in conj. with the ☽ diff. of dec. 3. 16. N.
20			Clock after the sun, 2m. 12s.
	—		☽ rises 11h. 3m. M.
	—		☽ passes mer. 3h. 13m. A.
	—		☽ sets 7h. 33m. A.
			Encke's Comet R. A. 16h. 26m. dec. 22. 46. S.
			Ditto passes mer. 22h. 29m.
	10	19	Ceres in conj. with ♃ diff. of dec. 10. 0. N.
21	17	34	⊙ enters Capricornus. Winter commences.
	23	9	♅ in conj. with the ☽ diff. of dec. 1. 6. N.
23	14	35	♃'s first satt. will im.
24	3	7	☽ in □ or first quarter.
	15	1	♃'s first satt. will im.
	20	0	☿ stationary.
25			Clock before the sun, 0m. 18s.
	—		☽ rises 0h. 13m. A.
	—		☽ passes mer. 7h. 16m. A.
	—		☽ sets 1h. 15m. M.
			Encke's Comet R. A. 16h. 52m. dec. 25. 38. S.
			Ditto passes mer. 22h. 36m.
	4	6	☿ in the ascending node.
	12		☽ in Perigee.
27			♂ greatest hel. lat. N.
29	1	38	Vesta in oppo. to the ⊙, intens. of light 0·656.
	18	13	☿ in Perihelion.
30	16	28	♃'s first satt. will im.
31	0	35	Ecliptic oppo. or ○ full moon.
	11	12	⊙ in Perigee.
			Encke's Comet R. A. 17h. 26m. dec. 27. 45. S.
			Ditto passes mer. 22h. 47m.
	17	34	♃'s second satt. will im.

J. LEWTHWAITE, Rotherhithe.

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Recent Patents.

To Hippolyte Francois Marquis de Bouffet Montauban, *of Sloane-street, Chelsea, in the county of Middlesex, colonel of cavalry, and* John Carvalho de Medeiros, *of Old London-street, in the city of London, merchant, for an invention of certain improvements in the means of producing gas for illumination, and in apparatus connected with the consumption thereof, being a communication from a certain foreigner residing abroad.*—[Sealed 28th February, 1838.]

The object of these improvements in manufacturing or obtaining gas for illumination is, to produce a greater quantity of gas from a given quantity of coal or other material, than can be obtained by the ordinary means, apparatus, or process commonly used in such manufacture; and consists in improvements in the process or mode of obtaining gas from coal or other material, and in the apparatus used in the same; that is to say, these improvements consist in collecting the crude or nascent gas, as it arises from the decomposition of the materials in the ordinary heated retorts, into one or more receiving chambers, and passing it through a decomposing chamber or chambers heated by a separate furnace, or that used for heating the retorts, but at a much lower temperature than that of the retorts; the interior of such decomposer being supplied with caloric conductors in the manner hereinafter described, set forth, and shown in the drawings.

It is a well-known fact that gaseous matter is a bad conductor of heat; and to remedy this defect, caloric conductors are placed within the decomposer to preserve an equal temperature, or nearly so, throughout the chamber, in order that the crude gas passing through it, with the tar and ammonia in a state of vapour, may be decomposed; whereas, without the said caloric conductors, a great portion of the tar, naphtha, and ammoniacal gas passes off undecomposed. We will, therefore, now proceed to describe the drawings of this improved apparatus, and the manner or process of carrying the same into effect.

Fig. 1, Plate IX., is a front view of a small gas-making apparatus, consisting of four retorts, which will serve to illustrate our invention: fig. 2, is a longitudinal section, taken vertically through the same, showing the interior of the decomposing chamber; and fig. 3, is a transverse section of the said chamber, showing the interior: A, A, A, A, are the retorts, set in brickwork B, B, and heated by the furnace C, and its flues D, in the usual manner. The gas, as it is evolved from the coal or other material, passes off from the retorts by the pipes E, E. The receiver or collecting chamber F, F, is formed of iron or other metal, and situated in any part of the apparatus, and should be placed as near the retorts and decomposer as convenient, for the purpose of preventing tar being condensed. The pipes connecting the retorts with the receiver and decomposer are each furnished with a slide valve *e*, or other suitable means, for the purpose of insulating one retort from the other during the process of charging and drawing the retorts. From the receiver or collecting chamber F, the gas passes by the pipe G, into the decomposer H, also formed of iron, and set in brickwork B, the decomposer passing through the same, and is heated by the same furnace as the retorts; but it may be set in other brickwork, and heated by a separate fire, if thought desirable; but this is not necessary, as it does not require to be heated to so high a temperature as the retorts, and, therefore, the waste heat escaping by the flues of the retorts will answer the purpose. The interior of the decomposer H, is supplied with the caloric conductors I, I, I, which are plates of iron, or other metal or substance, placed one above another, and supported upon each other by iron or other metal ribs or feet, as shown in the drawings. These caloric conductors extend nearly the whole length of the decomposer, and touch its bottom and sides, as shown in the drawings, and presenting an extensive heated surface to the gaseous inflammable matter as it passes through the said decomposer, as before stated, increasing the volume of gas from a given quantity of coal. The gas passes from the decomposer through the pipe K, to the hydraulic main L, and from thence, by a pipe, to the usual purifying apparatus.

We will now proceed to the several other transverse sectional figures of the decomposer, furnished with different shaped caloric conductors than those exhibited in figs. 1, 2, and 3, all of which are moveable, and may be easily and readily drawn out of the chamber, and others applied in their places when necessary.

Fig. 4, shows the caloric conductors as plates, placed vertically, and kept apart by a rib or stud; fig. 5, the same, as formed of radial plates meeting at the centre; fig. 6, coiled plates, kept apart by ribs or studs; fig. 7, a series of iron tubes placed in the decomposer; figs. 8, and 9, corrugated or curved plates, which touch each other, and form passages for the gas, without any ribs or studs to keep them apart. Fig. 10, shows the caloric conductors in the form of tubes and semicircular plates. All of these variations will present large heated decomposing surfaces to the gas, without offering any material opposition to its passage through the decomposer; and, therefore, we do not intend to confine ourselves to any one particular form or shape of caloric conductors, as the same may be varied at pleasure, without departing from these improvements.

And we will now proceed to state that when oils, resins, tar, pitch, bitumens, schistus, or other such matters, are used for making the gas, we prefer the application of water or steam in the process; but, when making gas from oils, resins, tar, pitch, or other bituminous matter in a liquid state, we mix the water with such material before placing it in the retort. This we effect by passing a given quantity of oil or other material into a barrel or other suitable vessel, together with the requisite quantity of water, and keep the same constantly agitated or stirred, in order to produce a proper admixture of the said materials during the time it is being passed into the retort.

Fig. 11, is a sectional diagram of an apparatus, which will serve to explain this improvement: *a*, is the barrel or chamber in which the water and oil is placed; *b*, the rotary fan or beater, placed on an axis turning in proper bearings at the end of the chamber, and kept constantly revolving by means of the winch handle *c*, or other means, while the materials are passing into the retort, which are allowed to percolate or drop from the vessel by the pipe *d*, into the funnel *e*, having a siphon fixed in it to prevent the escape of the gas. During the said operation, the inflammable materials (in a liquid state) descend, and drop on to a plate in the retort, which is to be supplied with the caloric conductors as hereinbefore set forth and described, a separate decomposer or chamber not being required.—[*Inrolled in the Rolls Chapel Office, August,* 1838.]

Specification drawn by Messrs. Newton and Berry.

[Since the sealing of the above, the Patentees have amended the title of their patent, by entering a disclaimer of that part of the title which follows the word "illumination;" so that the title, when so altered and amended, should stand thus,—certain improvements in the means of producing gas for illumination.—Ed. Lond. Jour.]

To WILLIAM LEWIS, *of Brimscomb, in the county of Gloucester, and* JOHN FERRABEE, *of Thrupp-mill, in the same parish, for certain improvements in machinery for dressing woollen and other cloths or fabrics requiring such a process.*—[Sealed 5th March, 1838.]

THE improved machinery specified by the Patentees, is applicable to those processes in dressing woollen cloth, commonly called raising, or rowing, or dressing, which consists in passing the cloth over and in contact with a cylinder covered with teasles, wire cards, brushes, or a mixture of these substances, for the purpose of raising the nap or pile, and carrying it smooth in one direction from one end of the cloth to the other; and the said processes are performed by us in the following manner:—

The cylinder B, figs. 1, and 3, Plate X., furnished with teasles or other suitable materials, is mounted in the frame A, A, and is connected by the horizontal shaft *a*, to the gearing driver, by a steam engine or other first mover. The cloth *k*, is passed over the horizontal guide rollers N, and L, *n*, *n*, and M, and in contact with the outer surface of B.

The two ends of the cloth are then sewn together in the usual manner for what is termed perpetual rowing or raising. A rapid rotary motion is then to be given to B, in the direction of the arrow. The axis B, carries a toothed pinion C, figs. 2, and 3, which drives the wheel D, fixed on the short horizontal revolving axis *b*, in a common bearing. On the same axis *b*, is fixed a bevel wheel G, driving a similar wheel, fixed on the lower end of the oblique shaft Q; and on the upper end of the shaft Q, is a bevel pinion H, working into the bevel I, fixed on the horizontal axis of the delivering roller K, which turns with it, and by these means the cloth K, is brought from the lower end of the inclined scray *l*, over the guide rollers before described, and moved in the direction of the arrow 2. A rigger E, fixed on the axis *b*, gives motion to an endless strap or belt O, which drives another rigger F, fixed on the horizontal axis of the tension roller M, which draws the cloth from the lower guide rollers *h*, *h*, and delivers it in folds on the inclined scray *l*, where it slides gradually to the bottom, passing continually in one direction against the acting surface of the cylinder B, as long as it is found necessary. The velocity of M, is somewhat greater than that of K, for the purpose of keeping the cloth at a proper tension against the cylinder B; but, in order to prevent too great a strain, the strap Q, is made slack, so as to allow the rigger E, to slip, rather than drive, the strap with more than necessary force. And, to ensure its acting constantly with a sufficient force, the strap is tightened by a tension pulley P, working on the axis C, which is fixed on the lever *f*, carrying an adjustable weight *g*, by which the attendant can give the proper degree of tension, as required, for the different kinds of cloth to be dressed.

Instead of the bevil wheels G, H, I, and the oblique shaft Q, another rigger, similar to E, on the same axis, and another endless strap or belt R, as shown more plainly in fig. 2, may be used with advantage to drive *k*, by means of a rigger F 2, similar to F.

The machine, as above described, is found to be convenient when the teasle or other substances are required to be frequently taken out, changed, or replaced; but when a brush is used, or wires, instead of teasles, it will be more advantageous to adopt the arrangement shown in fig. 4, where the direct effect is produced by the several movements explained by the same letters of reference as those made use of in figs. 1, 2, 3.

We do not confine ourselves to the precise manner shown of delivering the cloth to the operating cylinder, or of conducting it through the machine; for the same effect may be produced in a variety of ways. But we claim as our invention, the described method of dressing woollen or other cloths, by moving the dressing cylinder and the cloth in the same direction continually, and of regularly delivering the cloth to the cylinder, instead of allowing it to be dragged through or between tension bars or rollers, or from a roller having a brake attached to it in the common way; by which method it is always liable to irregular and injurious strains, as well as irregular action on the face or pile.—[*Inrolled in the Rolls Chapel Office, May,* 1838.]

To HENRY AUGUSTUS WELLS, *of New York, formerly residing at the North and South American Coffee-house, in the city of London, and now at 29, Henrietta-street, Brunswick-square, in the county of Middlesex, hat manufacturer, for his invention of certain improvements in the manufacture of hats.*—[Sealed 30th June, 1837.]

THIS invention consists of certain improvements in various of the processes of the hat manufacture, from the first process of clearing the fur and other substances employed in making the hat bodies, and used for napping, to that process of the hat manufacturer which consists in covering the hat body with a nap previous to its being dyed or sent to the hatter to be shaped and made up for wear.

Such improvements, stated more in detail, consist in new or improved methods. First, of clearing fur used in the making of hat bodies, and for napping. Second, of converting the same fur when to be used for the formation of the substance or texture for hat bodies into a fine web or fleece. Third, of applying steam in the formation of the latter into hat bodies. Fourth, of hardening or basoning. Fifth, of felting or planking. Sixth, of stiffening or proofing. Seventh, of covering hat bodies (commonly called ruffing or napping), and clearing the nap, all by means presently to be described; and also further consist in the production of an improved substance or texture for hat bodies, by means of the use or application of a much larger proportion of non-felting materials than have been used in making hat bodies heretofore, and whereby a pile or nap is so produced from such non-felting materials, conjointly with the felting furs or wools, as to render unnecessary the application to, or sticking on, of a nap to the hat bodies made of such improved substance or texture; and, in further compliance with the said proviso, I, the said Henry Augustus Wells, do hereby describe the manner in which my said invention of the said several improvements is to be performed, reference being had to the drawings annexed, and to the figures and letters marked thereon.

Fig. 12, Plate IX., is a longitudinal section of a blowing machine, used for the purpose of clearing the fur to be used in making the hat bodies, or to be used for napping. This machine consists of a cased frame, divided into three or more compartments, separated by the divisions I, I, each containing a cylindrical blower or picker, marked D, studded with small spikes or wires about five-eighths of an inch in length each, and placed about half an inch apart from each other, revolving on an axle, at the extremity of which is fixed a small pulley P, for the purpose of receiving motion from the moving or driving pulley L; A, and B, are two rollers (in each division) which must be made of the same length as the cylindrical blower or picker, and these I have generally made about thirty inches in length. These rollers carry an endless feed apron made of cloth, leather, or other suitable substance, and receiving motion from the belt connecting a small pulley on the driving shaft of L, with a large pulley on the axle of A, at the contrary side of the machine to that presented to view in fig. 12; C, C, are two feeding or delivering rollers of the same length as the rollers A, B; and M, is a wire grating or sieve in each division, suspended at the point N, on an axle, and having a slight reciprocating motion imparted to it by two pins or cams protruding from the shaft S, which latter is connected by a belt with the rollers B: E, E, E, are chambers covered with fine wire, woven sufficiently close to allow the air to escape without the fur. The machine being set in motion, and the workman having commenced spreading the fur upon the endless web connecting A, and B, at the feeding end of the machine under L, the fur will be obviously carried forward and drawn into the first compartment by the feeding rollers C, C; and the finer particles of the fur are driven or wafted by the quick revolutions of the cylindrical picker D, into the upper space E, the remaining particles in the meanwhile falling upon the wire grate M. Such part of them as consists of hair, will be caused to pass or fall through into the space or box H; and such of them as consist of dags and dirt, will be shaken off by the motion given, as above described, to the wire grating or sieve M, into the space G.

The fur, which is carried, wafted, or driven on to the feed apron of the succeeding compartments, will, in like manner, be drawn through the second compartment, and so, in like manner, through the third compartment, or any further number of compartments, and be ultimately brought out by the last pair of delivering rollers O, O, at the further end of the machine. The fur, when the same is intended to be used in making hat bodies, is then to be taken and placed upon another machine, for the purpose of being formed into a fine web or fleece, to be afterwards felted into hat bodies.

When the fur is intended to be used for napping, it should be gathered and set apart ready to be applied for napping; and so, also, the furs cleared by the said machine, suitable for hat bodies, may be gathered and made into hat bodies by any of the methods or processes now in use. I, however, take the said last-mentioned fur and make the same into a web or fleece by means of the machine next mentioned. The dags falling into the boxes G, may be again passed through the machine for the purpose of procuring any remaining portion of the fur which may have fallen with them.

Fig. 13, is a longitudinal section of the machine for forming the fur into a fine web or fleece. This machine consists of a common carding engine, having one main cylinder B, a feed apron, a feed roller, licker in, workers, strippers, fancy cylinder, and doffer, as represented, around it, all of which are so well known as to need no description, as it is in no way altered by me, excepting that the cylinders are smaller than usual, and that I place a circular covering over the fancy, so as to throw the fur raised by itupon the doffer cylinder. And I have also attached a second fancy cylinder marked C, driven by the pulley T, by which all the fur thrown upon the doffer by the first fancy, and all that which may be taken by the doffer from the main cylinder, is thrown by the last fancy into the air in the next department of the machine, where it is formed into a web by the following machinery: G, G 1, G 2, are three rollers, receiving their motion from the pulley D, which latter takes its motion from a pulley Y, on the same shaft, which moves the feed apron of the cord by the belt marked U. Around these rollers there is an apron or endless fine woven wire N, through which air can pass, but not the fur; *b*, *b*, are two apertures through the side of the machine, for the purpose of admitting air; E, is a fan formed on a shaft, resting on, and turning in, bearings between the apertures *b*, *b*, and supported on the other end by an upright outside the frame. This fan is formed of a flat circular board, about four feet in diameter, to which, next the frame, are affixed four fans marked *h*, *h*, *h*, *h*, made of sheet iron, or some other thin metallic substance, about one foot wide, revolving as near to the side of the machine as possible, without danger of coming in contact: V, is a projecting board, covering about two-thirds of the space between the fancy O, and the first roller G; e, e, are two rollers, bearing and revolving by contact upon the rollers G 1, G 2, and having a lateral motion given to them by two levers R, R; these two levers rest or move upon centres f, f, near the middle; the upper ends slide in an eccentric groove, varying one half inch from a true circular line, fixed on the same shaft as the pulley O, which latter receives motion from the driving pulley L; H, is a small pulley worked from G, and having a crank or pin I, fixed to the side thereof. To this crank is attached a connecting rod *l*, communicating at the other end with a board J.

The machinery being set in motion by the driving pulleys K, L, M, N, the fur coming from the card fancy C, after having passed through the carding machine, will be drawn forward by the fan E, and be conducted upon the endless wire web N, covering G, G 1, G 2, from which it will be conducted, after being somewhat hardened by the pressure and lateral motion of e, e, in the direction of g, upon the board J, there laid in successive folds by the motion which the board receives from the crank I, and in this state, when in sufficient quantity, it may be removed either to the next machine in order to its further use in forming that body, or otherwise applied in forming the hat body by any of the processes now in use. The foregoing machine and carding engine are surrounded by a wooden case marked P, P, P.

In the accompanying drawings, fig. 14, represents a front elevation of another machine to which the web of fur is next to be conducted, for the purpose of being formed into a hat body: A, A, represent the several upright pieces of the framework; L, L, are two pieces of horizontal framework, connected by girths or stretchers, and properly supported, and have on their top surfaces a rib of iron extending the whole length, to form a railway for the carriage resting upon the wheels K, K; N, N, are two uprights, connected by two girths resting on the axles of the wheels K, K; N, N, are connected by the board W; the said uprights N, N, at their tops support the bearings of the two rollers R, R. On the underside of the bottom of the carriage is placed a piece of board two inches wide, and one and a half inch thick, fixed transversely. In this piece of wood is fixed a pin, connected to a crank by the rod or shaft n; which crank works under the carriage, and produces a traverse or alternating motion of the carriage. The crank shaft receives its motion by the bevel wheel T, geered into bevil U, fixed upon the shaft V, which is supported by framework, and receiving motion from the driving pulley B, by the pinion D, working into a spur wheel C; P, and P 1, are two pulleys fixed upon the ends of the rollers R, R, and connected together by a belt; O, is another pulley fixed on the axle of the lower roller R, receiving motion from the pulley J, by means of a belt. In the shaft I, is a groove to admit of the pulley J, sliding upon the same as the carriage traverses; and in this pulley is a corresponding key, so that both shall revolve together without the latter being confined endwise. On the shaft I, is fixed a pulley H, receiving motion by a belt from the pulley G, which is set in motion on being properly connected with the driving pulley B; S, is a shaft, supporting and passing through a double cone X, X, made of tin or other light substance, covered with cloth, and on which the flat bodies are to be formed. In the centre of the said cones, is a small groove g, for the convenience of dividing the hat bodies when formed and ready to be removed.

On the shaft S, is a pulley F, receiving motion from the pulley E, by a belt. A small box is placed nearly under the centre of the cones, to receive any fur that may fall from the cones; and directly underneath the cones, are small pipes having minute apertures, for the purpose of admitting steam to the web in its progress towards the cones; and, also, when on the cones, for the purpose of giving the hat body a more adhesive or felting quality.

The machinery being set in motion by means of the pulley B, the web or fur is to be brought from the machine, fig. 13, and laid upon a board placed near to the cones; one end of the web is to be then gently raised from the board and passed over the carrying rollers R, R, and thence be conducted to the cones X, X; and while the carriage traverses from side to side, the web covers the cones from point to point; and it should be wound from three to five times round the cones, according to the substance of the bodies required. The hat bodies from these cones, or otherwise constructed upon other cones, may then be hardened in the manner next hereinafter described.

When the cones are covered, they may be removed and replaced with other like cones, ready to receive the web or fleece for the hat body. Fig. 15, represents a machine for hardening or basoning. The cones X, X, taken from the machine, fig. 14, when the hat bodies have been formed upon them, or other like perforated cones with hat bodies upon them, or formed upon them, are then used in the said hardening or basoning machine, in the manner hereinafter described, for the purpose of hardening the hat bodies thereon. The cones X, X, or such other cones as last mentioned, I call hereafter, for the sake of distinction, "the hat body cones." Two other perforated metallic cones of rather larger size, which, for the sake of distinction, I call "cap cones," are then placed upon or over the bodies contained upon the hat body cones, so as to confine the bodies completely between them. The hat bodies, where they join at their bases, are then cut around to separate them; they are then ready for the next process, that of hardening or partially felting, commonly called basoning. The bodies so enclosed between metallic cones are then taken to the machine, fig. 15, where one pair of the hardening cones only are shown; but it is evident, any number of the like construction may be combined and operated by the same moving parts as are here shown: A, and B, fig. 15, are two hardening cones, made either of wood or metal; A, having coarser perforations than either pair or set of the above cones, which coarser perforations are made for the admission of steam to the body. One pair, or set of cones, is now placed on the cone A, by depressing the handle 1, from the pin 2, to the pin marked 3; the other end of the lever 4, in which it will be seen the axis of the cone B, rests, will cause the cone B, to be lifted from the cone A, so as to place upon the cone A, one of the hat bodies, included, as before stated, between two perforated cones.

This being done, by lifting the handle 1, the cone B, is again let down, so as to rest upon the outer cone; steam is then let up into the cone A, by turning the cock 5, (the axis of A, being a hollow steam pipe 6, with a stuffing box at 7.) The two cones A, and B, now receive an alternating rotary motion in the following manner,—moving two or three times in one direction, and then being reversed and moving the same number of times in the opposite way; C, is the driving pulley or prime mover, upon the axis of which is the crank D, connected with the shackle bar E, secured by the stud F, to the wheel G. As the crank D, revolves, it will be seen that the wheel G, will alternate through about one-fourth of its circumference. This alternating motion will be communicated by the band 8, to the pulley H, upon the axis of which is a bevelled wheel 9, acting upon another bevelled wheel 10, upon the axis of the cone B. The cone B, resting with its weight upon the outer cone, immediately under which is the hat body, resting upon the hat body cone placed upon the cone A, will, by its weight and contact, cause the said several cones and body to revolve, as before described, two or three times in each direction, which, if continued for a very few minutes, causes the body between the said perforated cones to be hardened or basoned ready for the next process to be performed by the machine called the planking machine.

Fig. 16, represents a longitudinal section of a machine to be used for planking, reducing, or felting hat bodies: A, A, is a frame or stand, on which is placed a trough containing water, slightly impregnated with sulphuric acid, and kept boiling by a coiled steam pipe marked C, lying at the bottom; D, D, are rollers formed of a composition of zinc and lead, or other suitable metallic substance, each pair being geered at their ends by pinions, and the upper roller of each pair geered into the horizontal worm or screw marked E; O, is a guide; H, is a larger roller geered into the end rollers D, for the purpose of turning the hat bodies over and giving them direction backwards on the top of the machine, after they have been passed successively through each pair of rollers; at the ends of these rollers are levers, having weights bearing upon them suspended to each upper roller, for the purpose of giving a slight pressure to the hat bodies, as the substance of each may require; I, is an inclined board, for the purpose of giving the hat bodies, when laid thereon by the workman, a direction towards the rollers; K, K, is a fast and loose driving pulley on the worm shaft F. The machinery being set in motion, and the hat bodies placed one after another upon the inclined board I, the hat bodies will be drawn forward, and by keeping the bottom rollers, and a portion of the top rollers immersed in the boiling acid mixture, as shown by the dotted line, they will be continually exposed to the action of the same, till they come out at the farther end, and return on the top of the rollers to the operator to be crossed, [a term well known to hat manufacturers,] and again passed through the machine as often as may be necessary to render them fit for proofing. About fifty pair of rollers may be used to advantage.

The number of rollers may be varied in the different machines, according to the substance of the bodies, and the quantum of work or felting required. Fig. 17, is a cross section of a machine for stiffening or proofing: A, is a vessel having two compartments, separated by the division B, and containing a solution of shellac or other substance commonly used for stiffening or proofing hat bodies—the solution in one compartment being somewhat stronger than the solution in the other, according to the strength of the stiffening required; C, C, are two small rollers turning on bearings fixed in the standards D, D, geered together at their extremities E, E, and turned by the fixed driving pulley F; H, is a joint to allow the standard D, to fall back when required; I, is a weight suspended to the line K, K, running over the pulley L, and fixed at its other end to the standard D, for the purpose of causing the rollers to press against each other with sufficient force, that when the rollers are set in motion, and the body of the hat (being previously soaked in the solution contained in the box A, and placed in the proper position to be taken by the rollers upwards,) is allowed to be drawn through or between the said rollers, the pressure shall squeeze out all the superfluous stiffening solution which will fall down upon the board M, and thence be conducted back into the same compartment in which the hat body had been immersed. The more stiffening there may be required in the body, the less should be the weight used to compress the rollers.

Fig. 18, is a plan view of machinery, for the purpose of covering hat bodies, commonly called ruffing or napping and clearing the nap: A, is a water-tight box, the upper part of which is made to open; B, the axle of two driving pulleys marked C; D, is a strap or band which communicates motion from the driving pulley C, to the small pulleys E, E, E, fixed upon the hollow axis F, of the cones G, through which the steam is admitted into the said cones from the supply steam pipes; H, H, conical riders or rollers revolving by contact upon the hollow cones; K, K, is a pipe for conveying hot water from a funnel, from which pipe descend others placed perpendicularly over the tips of the cones: these pipes being perforated at the bottom, allowing hot water to drop or run upon the tips of the hat bodies upon the cones. On each of the said cones G, is placed a hair cloth, in the shape of a hat body or cap, somewhat larger than the cone, so as to hang from its lower side; and in this hair cloth cap is placed a hat body, having the fur previously laid upon it and wetted, and being somewhat longer than the hair cloth. Over the hat body, and somewhat larger than it, is placed another hair cloth. Hot water should be poured into the funnel, which will drop or run through the small perforations in the perpendicular tubes upon the hat body; a slow motion is then given to the cones, by applying steam or other power to the driving pulleys, and which slow motion is continued until the nap has stuck, when the said cones should be made to revolve quicker, and steam admitted into the interior through the pipes H. The hat body, then scalded, should be allowed to remain upon the cone revolving, and exposed to the steam and the hot water about twenty minutes, by which time the nap will be sufficiently scalded in, if the operation be conducted with care and attention. The hat body should be taken off, turned, and put in again two or three times during the operation. Several hat bodies may be placed upon each cone, and may be operated upon at the same time, the steam and hot water being admitted in sufficient quantities according to the judgment of the operator. The steam is also again applied to the interior of the cone, which must now be made to revolve with greater speed; the effect of the centrifugal force will then be to throw off the water from the hat body, being also assisted by the steam, when the nap will be cleared, or in effect raised up in readiness for blocking; or for more effectually accomplishing this, a conical or cylindrical brush, roller, or rider, may be made to revolve upon the cone by contact or otherwise, with or without a reciprocating lateral motion.

It will be obvious that, although my improvements extend over, and are applicable to all the several processes of the hat manufacture hereinbefore mentioned, from the process in clearing the fur, to that of napping the finished hat body, and may be all used in one and the same hat manufactory, yet some of these improvements may be used separately, in conjunction with, or for the purposes of some of the existing processes or methods of manufacturing hats; and I claim the same improvements separately, in manner herein stated, and do claim an exclusive right and privilege in the same, and in each of them, during the term of the said Letters Patent.

Now whereas, having of necessity described many parts of the above-mentioned machines which are old, though, perhaps, some of them appear in a new form to accommodate my improvements, I hereby declare that I only claim as those which constitute my improvements in the manufacture of hats; first, the aforesaid method of clearing fur used in the making of hats, or for napping hats by means of a machine which I call a blower, containing three or more pickers substantially hereinbefore described; second, the aforesaid method of producing H, H, a web or fleece of fur upon a wire apron, and hardening the same by means of rollers substantially, as hereinbefore described; third, the aforesaid method of forming the aforesaid web into hat bodies on perforated cones when covered with cloth, and the application of steam to such web, or the hat body while being formed of or from the same substantially, as hereinbefore described; fourth, the aforesaid method of hardening or basoning of hat bodies substantially, as hereinbefore described; fifth, of felting or planking by means of the application of a series of rollers substantially, as hereinbefore described; sixth, of stiffening or proofing substantially, as hereinbefore described; seventh, of covering hat bodies (commonly called ruffing or napping), and clearing the nap substantially, as hereinbefore described. And it may be necessary to state, that I do not claim the machine for forming hat bodies, hereinbefore described, but only the use of perforated cones covered with cloth, to receive the web or fleece of fur, and the application of steam to the said web or fleece, when the same is being formed into the hat body. And, in respect to the said other machines, and the claims hereinbefore lastly stated, it is proper that I should add, that I do not claim the several individual parts of which the aforesaid machines are composed as new, but such a combination and arrangement of them substantially, as before described and claimed as being new, for producing the effects hereinbefore described.

And whereas, it is well known that a very small portion of silk and other non-felting materials have been used in the substance of hat bodies; and the use of such non-felting materials therein, hath chiefly been confined to preventing the too quick felting of furs or wools used in making the hat bodies upon or over the surface of which it is the usual and common practice to put a covering or nap of fur, or woven plush or down of silk, cotton, and other materials constituting the nap of the hat; and such non-felting materials have not been used or applied in the manufacture of hat bodies, for the purpose of procuring from the body itself (without affixing a nap, as is usually done,) a full, thick, and durable nap. Now, I do claim as a further improvement in the manufacture of hats, the production of such improved substance or texture for hat bodies, as hereinafter is described, furnishing from itself a full and durable nap, as hereinafter mentioned, and rendering unnecessary the sticking on of a nap, which is the common and universal practice.

The mode I have found best in practice, for performing my said last-mentioned improvement, I describe as follows:—I take any description of fur or wool of a high felting quality, but I prefer caroted hares fur, which is well known to hat manufacturers, and I clear the same from kemps, dirt, and dags; and this I prefer doing by means of my first-mentioned blowing machine, hereinbefore described, through which I pass once the fur to be used. I then take, at least, one third, by weight, of non-felting materials, such as silk or cotton; but I prefer with the caroted hares fur the use of the waste raw silk when heckeled or prepared, an article well known in commerce. I cut this raw silk into lengths, from three quarters to one inch in length, which afterwards provides a suitable nap, as hereinafter described; but the nap will be shorter or longer, according as the silk may be cut into long or short lengths.

More than one third of the non-felting materials may be used without injurious results to the felting of the hat; and where less than one third may be used, a nap may be procured from the hat body, although not so full and thick as when one third of the non-felting materials shall be used. But, as before stated, I use a third, by weight, of non-felting materials; and I find that proportion the best adapted for felting with the fur, and afterwards producing a full, thick, and durable nap. When the silk has been so cut, it is mixed thoroughly with the fur so cleared, as before mentioned: which fur, by weight, should be double in quantity to the non-felting materials. I accomplish this mixing by passing the fur and non-felting materials through my said blowing machine; and I gather the materials which have passed through the said machine, and form them into a web, and subsequently into hat bodies, by means of the second, third, fourth, and fifth machines, hereinbefore mentioned. After the hat body has been hardened or basoned, and planked or felted, and before it is stiffened, it should be examined; and when dry, cleared, by means of a shaving knife, of all kemps that may be visible; after which, it is dipped into boiling hot water, and by means of a fine small hand card, similar to those used by hatters, the nap is drawn out or carded up. During this process, the hat body should be as frequently dipped into the hot water as may be found necessary. After the nap has been sufficiently brought out, which can be easily judged of by the workman, the hat body, when again dried, is stiffened and waterproofed. The process of stiffening and waterproofing, I perform by means of my machine hereinbefore described.

Although I have described the mode of mixing the silk and fur, and forming the same into a hat body, chiefly having reference to the use of my said several machines, yet such silk and fur may be mixed together by other means well known to hat manufacturers, and a substance or texture for hat bodies may be formed thereof by means of the methods usually practised at present for making hat bodies, and a nap be brought out therefrom by similar means to those hereinbefore described. A hat body of cheaper materials, and well suited for commerce, can be made of coney wool and fine cotton mixed in the like proportions of the two thirds of wool to one third of cotton, by pursuing with the same a process similar to that which I have lastly hereinbefore described, where caroted hares fur and waste raw silk, cut into short lengths, are used. Other suitable furs and suitable non-felting materials may, when prepared and mixed in like proportions, be similarly formed into hat bodies, out of which a full and durable nap can, by carding, be obtained.

Now, having described the mode of performing my last-mentioned improvement, I do not claim any novelty either in the materials used, except as to the proportions, or in the processes by which hat bodies are usually, or by means of machinery, made by hat manufacturers. But I do claim, as a further part of my said invention, agreeably to the above description, the production of an improved substance or texture for hat bodies, by means of the use or application of a much larger proportion of non-felting materials than has hitherto been used, viz., a proportion equal to one third, by weight, of the whole materials used; and from which substance or texture, or from such larger portion of non-felting materials therein conjointly with the felting materials, I produce or procure a full and durable pile or nap, and by which means the necessity of putting on or affixing a nap, will be obviated in all cases of hats made out of the said improved substance or texture. It will be obvious, that although all the several improvements before mentioned are described to take place in those processes of the manufacture of hats, which are usually performed, previously to the hat bodies being dyed or made up and shaped for wear, yet the hatter, according as he thinks fit, will be enabled to form the same hat bodies into various shapes, sizes, and colours of hats, either with, or without brims, or bonnets, or caps, for the use of the public.—[*Inrolled in the Rolls Chapel Office, December*, 1837.]

Specification drawn by the Patentee.

To Henry Stephens, *of Charlotte-street, in the parish of St. Marylebone, in the county of Middlesex, gentleman, and* Ebenezer Nash, *of Buross-street, in the parish of St. George's-in-the-East, in the county of Middlesex, tallow chandler, for certain improvements in manufacturing colouring matter, and rendering certain colour or colours more applicable to dyeing, staining, and writing.*—[Sealed 18th April, 1837.]

These improvements in manufacturing colouring matter, and rendering certain colour or colours more applicable to dyeing, staining, and writing, consist, in the first place, of several improvements in making or manufacturing the ferro-prussiates, that is, prussiates of potash and soda; secondly, in rendering Prussian blue soluble, and thereby more applicable than heretofore, to the purposes of dyeing, staining, colouring, or writing; thirdly, in a peculiar manner or method of treating or operating upon cochineal and on lac dye, by combining the colouring matter of cochineal or of lac dye with other matters, so as to produce a superior red fluid, applicable to writing, staining, or colouring; and, fourthly, in combining carbon with other colours, so as to form a writing fluid or ink which cannot be entirely effaced by chemical agents: all of which improvements we are now about to describe under different heads or sections; that is to say, our first improvement consists in converting certain gaseous products arising from the present mode of making prussiate of potash or soda from animal matter, which are now commonly allowed to escape into the atmosphere, to the purpose of making prussiate of potash or soda, so that an increased quantity of prussiate of potash or soda may be obtained from a given quantity of animal matter.

For the better explanation of this part of our invention, we refer to the annexed drawings. Plate IX., fig. 19, represents an apparatus for effecting the process of converting the gas evolved into prussiate: *a,* is an iron pot, vessel, or retort charged with alkali and animal or other matter containing azote, or yielding ammonia, which vessel is to be heated to a low red heat. This pot or vessel has a moveable cover, which is to be luted on when under operation, but may be removed and placed upon another pot *b,* by disconnecting the joint in the pipe *c,* the joint allowing the head of the pot *a,* to be carried round with the connecting pipe *c.* The pipe *c,* is for conducting the gaseous products, arising from the decomposition of the said animal matter in the pots *a*, or *b*, into an iron cylindrical or other conveniently shaped vessel *d*, heated by a furnace *h*, below. This vessel *d*, is to be charged with alkali, and to be kept at a full red heat during the operation: *e*, is a pipe leading from the cylindrical vessel to a closed vessel *f*, containing a solution of alkali. This vessel is furnished with a jet pipe or burner *g*, which is merely intended as a gauge cock to ascertain the state of the gas within: *i*, *i*, are furnaces under the pots *a*, and *b*. The gas generated in the retort *a*, passes by the connecting pipe *c*, to the cylinder *d*, where meeting with the alkali in a state of fusion, the effect will be, that the gas becomes combined to a certain degree with the alkali, and forms prussiate of potash or soda; but there may be portions of the said gas which do not combine or commix with the alkali; these will pass off by the pipe *e*, to the closed vessel *f*; and if any of the gas thus passed off should be capable of combining with the alkaline solution, it may do so in the closed vessel *f*, and that portion which does not combine with the alkaline solution is allowed to pass off by the gas jet pipe *g*: the state of operation may be ascertained by burning the jet gas from the end of this pipe; for when it ceases to burn freely, the connexion between the pot *a*, and cylinder *d*, should be disconnected, and the head and pipe *c*, be removed round and luted on to the pot *b*, which is to be previously charged with animal matter and alkali, the distillation of which will proceed, as before described.

When the gaseous products of several charges have been passed through the cylinder *d*, containing the alkali, the cylinder may be opened, and the charge (which will now consist of crude prussiate of potash or soda, or "metal," as it is commonly called in the trade,) be withdrawn into an iron vessel, and, when cold, be lixiviated in cold water in the usual manner.

The further decomposition of the charge of animal matter in the pot *a*, may now be conducted in the ordinary manner of making prussiate in the open vessel, by increasing the heat, the contents being agitated as usual. This process may be repeated alternately in the two pots *a*, and *b*, the completion of the decomposition of the charge of one being effected while that of the other is subjected to the lower heat, and the operation of distilling off its vapours and passing it to the retort or vessel *c*.

A similar effect, viz. that of taking up the gaseous products, so as to produce an additional quantity of crude prussiate of potash or "metal," may be obtained in an open conical chimney, having a false bottom or grating, or perforated plate, upon which dry potash or soda is placed, so that the gas generated in the pot below may pass through the stratum of alkali in the chimney.

Fig. 20, is a sectional elevation, representing this application of the improvement: E, is the chimney or open cone usually placed on the top of an ordinary pot F, for making prussiate of potash, in order to convey the flame upwards; G, is a grating or perforated plate, placed at the base of the cone E. Upon this grating or perforated plate G, a stratum of dry potash or soda is laid; and as the gas passes upward through this stratum, a portion of it will become combined with the alkali. The chimney, with the stratum of alkali, may be removed when the flame begins to burn weak, and it may be set aside and applied to further charges, or put into the pot and worked off with the charge in the usual manner of making prussiate of potash or soda.

Our second improvement, viz. the mode, method, or process of treating or operating upon Prussian blue, so as to render it more perfectly soluble, or more readily disposed to be acted upon by the subsequent process of solution than when manufactured in the usual way; and in order that the same may be more applicable to the purposes of dyeing, staining, colouring, and writing, we effect in the following manner:—

We take the Prussian blue, whether produced from a combination of prussiate of potash and salts of iron, or the Prussian blue of commerce, as commonly manufactured, and we put this into an earthen vessel and pour over it a quantity of strongly concentrated acid, sufficient to cover the Prussian blue: muriatic acid, sulphuric acid, or any other acid which has a sufficient action upon iron will do. If sulphuric acid is used it should be diluted a little, that is with a quantity of water equal to about its bulk, at the time when the mass turns white after the Prussian blue is put in.

The Prussian blue is to be allowed to remain in the acid from twenty-four to forty-eight hours, or longer. We then dilute this mixture with a large quantity of water, stirring it up at the time, for the purpose of washing from it the salts of iron. When in this state of dilution, we suffer it to stand until the colour has subsided, when the supernatant liquor is to be drawn off with a syphon, and more water added to it; and we continue the repetition of this process until we judge that the acid, with the iron, has been completely washed away; and this is known by testing it with prussiate of potash, which will show if it yields any blue precipitate; if not, it is sufficiently washed. We then place it upon a filter, and suffer it to remain until the liquid has all drained away.

The Prussian blue, thus prepared, is reduced to a state, as we conceive, containing less iron than the Prussian blue of commerce, in which state it is more readily acted upon and rendered soluble than in any other condition. This Prussian blue may be then placed in evaporating dishes, and gently dried. To form the Prussian blue so operated upon into a solution, we add to it oxalic acid, and mix them carefully together, after which we add cold water (cold distilled water is best) a little at a time, making it into a dense or dilute solution, according to the colour required. The quantity of oxalic acid may vary according to the quantity of water used. It will be found that the Prussian blue that has undergone the process of digestion as described, requires but a small quantity of oxalic acid to dissolve it; about one part of oxalic acid will dissolve six parts of Prussian blue (the weight taken before digesting in the acid): this will answer for a concentrated solution, but for a dilute solution more acid will be required. Prussian blue that has not undergone digestion in acid in the way above pointed out, will require a much larger proportion of oxalic acid, from twice to three times its weight; and even then it will be greatly liable to precipitation after standing; but when treated in the way described, it is not liable to precipitate, but remains a permanent solution.

The chief obstacle to the general employment of the beautiful colour obtained by means of the ferro-prussiates to the purposes of dyeing in the silk, cotton, linen, or woollen manufactures, and also to the purposes of staining and writing, has been its hitherto supposed insoluble nature; but, by means of oxalic acid (whether obtained by the usual process of mixing or distilling saccharine matter in combination with nitric acid, or from vegetable or other substances containing oxalic acid, or from combinations of oxalates, whether metallic, earthy, or alkaline,) we obtain the above perfect solution of the Prussian blue which is applicable to dyeing, colouring, or staining in the various manufactures of woollens, silks, linen, cotton, paper, and such other substances as are required to be dyed or stained; and which solution is also available to the purposes of writing, or forming a writing fluid or ink, to be used with steel, quill, or other pens.

Our third improvement, consisting in a peculiar manner of treating the colouring matter of cochineal or of lac dye with other matters, for the purpose of converting them into a red solution or dye, is effected by dissolving, in boiling water, a quantity of common soda, potash, or carbonate of ammonia, to which is to be added, at intervals, twice its weight of crude argol, in powder. When the effervescence arising from this combination has ceased, we pour off the solution, or filter it from the insoluble matter: to this we add, by measure, half the quantity of oxalate of aluminæ or oxala-phosphate of aluminæ, which we prepare by adding to precipitated aluminæ or phosphate of aluminæ, in a damp state, as much oxalic acid as will dissolve it. Into this mixture we put, when cold, as much cochineal, first bruised or powdered, as will give it a fine red colour, varying the quantity according to the shade of colour required; and after letting it stand for the space of forty-eight hours, we strain it off for use.

Our fourth improvement, viz. combining carbonaceous matters with other colours, so as to form a writing fluid or ink, which cannot be decomposed by chemical agents, consists in dissolving resinous substances in solutions of alkali or alkaline salts by means of heat, and adding to this, fine lamp black or other carbonaceous matter.

We take common carbonated alkali, or the potash or soda of commerce, or ammonia, or some of the other alkaline salts will answer the purpose, and mix it with a resinous matter, such as shellac or rosin, about equal parts, by weight, of each, although we do not confine ourselves precisely to those proportions; we then add water, according to the required strength of the solution, and boil these until the resinous matter, or a great portion of it, has become dissolved. We then mix in a mortar the necessary quantity of fine lamp-black with this solution, and thereby produce a black liquid, which black liquid may then be mixed with other suitable coloured solutions to form an indelible ink; such colouring matter as is soluble in alkali will mix best with this composition.

In conclusion, we desire it to be understood that we do not claim any of the apparatus or machinery described, nor the calcination of animal matters in close vessels; but we do claim the method of obtaining a product of prussiate of potash or soda from the gases evolved from the distillation of animal matters, or any other matters that yield azote and carburetted hydrogen, such, for instance, as coal, by means of passing those gases direct into a mass of alkali in a state of ignition, and into a solution of alkali contained in separate vessels, either closely or distantly connected with the distillatory apparatus; secondly, we do not claim the use of acids for the purpose of brightening or improving the colour of Prussian blue in the ordinary manner; but we do claim the use of strong acids for the purpose of digesting dry Prussian blue of commerce, in order to render it more easily soluble in the oxalic acid than it would be without such digestion.

And we further claim the use of oxalic acid, however obtained, as a solvent for Prussian blue generally; but more especially as a final process for making a perfect solution of the Prussian blue which has been prepared and digested in the manner above described.

Thirdly, we claim the application of oxalate or superoxalate of aluminæ, or oxala-phosphate of aluminæ, in combination with the other materials described, for the purpose of making a red solution for writing, staining, or colouring; and, fourthly, we claim the combining or mixing of carbonaceous matters with saline and alkaline solutions of resinous matter, for the purpose of mixing with coloured solutions to form compositions for the purpose of writing, which writing shall not be capable of being effaced by any chemical agent.—[*Inrolled in the Rolls Chapel Office, October,* 1837.]

Specification drawn by Messrs. Newton and Berry.

To JOHN WHITE, *of Manchester, in the county of Lancaster, engineer, for his invention of certain improvements in apparatus usually employed in lathes for turning metals and other substances, which improvements are also applicable to other useful purposes.*—[Sealed 19th December, 1837.]

THESE improvements in apparatus usually employed in lathes for turning metals and other substances, and which improvements are also applicable to other useful purposes, consist, firstly (with reference to lathes), in the novel construction and application of apparatus constituting the chuck or face plate by which the work to be turned is secured and held in its proper position while under the operation of the cutting tool. This improved chuck is rendered "universal," that is, capable of holding work of any diameter, or of unequal dimensions, and also of being made eccentric, as occasion may require. The improved chuck is formed by having a convolute curved groove cut upon a disc of metal, in which pins upon the sliding studs or holders travel, and thus cause the holders to close upon the work, and secure it firmly upon the chuck or face plate of the lathe.

As the novel application of this apparatus is suitable to many other useful purposes, I will explain, firstly, by reference to the drawings attached hereto, its use as applied to lathes of all descriptions. In Plate X., fig. 1, represents the principal feature of my improvements, as applicable to lathes; and its application to other useful purposes must be determined by its peculiar combination with parts of such mechanism to which it may be applied, as will be illustrated by the following figures:—

It consists of a circular plate or disc of metal *a, a,* having a groove *b, b,* formed or cut in it; which groove constitutes a regular convolute curve, coiling in equal curves from the periphery towards the centre of the disc. The plate or disc *a, a,* is also shown in its relative position, as forming part of an universal chuck in fig. 2, which is a vertical section of my improved chuck; and in fig. 3, which is a plan or horizontal view of the same complete. Fig. 4, is an inverted view of the top plate and remaining parts, having the grooved plate *a, a,* removed.

The nogs, studs, or holders for securing the work are shown at *c, c, c*; they have pins *d, d, d,* fixed in them, the lower ends of which run in the convolute groove or passage *b, b,* and by turning this plate round, the nogs or holders are simultaneously brought towards the centre as they slide in the slots or mortices *d, d, d,* cut in the top plate *e, e.* In order to prevent any strain of the work thus held by the nogs *c, c, c,* from causing a lateral stress upon any one of them; and at irregular intervals they are furnished with broad shoulder plates or pieces *f, f, f,* which being confined between the plates *a,* and *e,* will entirely prevent such strain or lateral pressure from upsetting any particular nog, and will assist to distribute the pressure or resistance equally upon the chuck. To accommodate the passage of the nogs or holders *c, c, c,* these plates *f, f, f,* swivel upon their centre pins and nuts *g, g, g,* which are allowed to slide in the mortices or slots *h, h, h*; also a cut in the top plate *e, e.* The plates *a,* and *e,* are held together and separated at pleasure by the centre screw *i,* and the chuck may be fixed upon the spindle in the fast headstock of the lathe by the nut *k.*

It will be evident that this universal chuck may readily be made eccentric, by shifting one of the pins *d,* into any other part of the convolute groove *b, b.* This apparatus is also exceedingly useful as applicable to slide lathes as an universal stay or clam; it may then be constructed of a simpler form, and similar to the one to be described with reference to figs. 5, 6, and 7, where this apparatus is represented as applied to a screw stock for bringing up three discs simultaneously, for the purpose of screwing shafts or bolts. When used in this form in slide lathes, it may be held in the slide rest or tool carriage immediately behind the cutting tool, and thus form an universal stay or clam for all diameters of shafts, &c.; and at the same time perform the operation of polishing or burnishing the work, when it will receive a high finish without any further work being necessary. It will also be obvious that this apparatus will become an universal centre finder for all diameters of cylinders, wheels, pulleys, &c., when thus used in connexion with turning lathes or other machines, and may also be advantageously employed as a feeding motion for the traverse of all slide rests.

This apparatus is represented as applicable to bringing up the dies simultaneously in stocks for screwing bolts, bars, &c., in fig. 5, which is a plan or horizontal view of the screw stock complete; fig. 6, is a section of the same, taken at the dotted line A, B; and fig. 7, is a plan view of the disc or plate *a, a,* with the convolute curved groove *b, b,* formed in it, as above described. The top plate *c, c,* has dovetailed slots or mortices cut in it, in which the dies *d, d, d,* slide; and by turning this plate by means of the handle *e,* the pins *f, f, f,* fixed in the dies, and running in the curved groove *b, b,* will cause the dies to be brought up towards the centre simultaneously, until they embrace the bar or bolt to be screwed, the plate *a, a,* being fixed to the vice bench lathe, or any other suitable machine driven by power, such as are in common use.

Another useful application of the convolute grooved plate is represented at fig. 8, which represents a combination of apparatus forming a horizontal vice upon an improved construction; and the remaining figures are detached views of the several pieces composing the same: *a, a,* is the plate or disc of metal, with the convolute curved groove *b, b,* formed upon it. It must be remarked that the plate is drawn as inverted in this figure, in order to show its application; but it will be obvious that the plain surface of the plate should be uppermost, which will prevent the convolute groove from becoming choked with filings or dirt; *c, c,* are two levers composing the main jaws of the vice, having their fulcra at *d, d,* and pins *e, e, e, e,* inserted in their extremities. The plate *f, f,* is to be bolted to the vice bench, and carries the supports or bearings of the fulcra *d, d:* the holding jaws of the vice are shown at *g, g,* and are allowed to turn loosely upon their centre pins or studs *h, h,* which bear in the main levers *c, c,* and thus enable the vice to hold work which has either parallel, oblique, or any unequal sides. It will now be seen that, as the pins *e, e,* in the levers *c, c,* work in the convolute groove *b, b,* as the plate is turned round, the jaws *g, g,* will be brought together, and thus hold the work to be operated upon firmly in the vice, and with almost any extent of power. In this arrangement of apparatus, the capacity of the vice may be easily adjusted by shifting the pins *d, d,* into the other bearings or holes *i, i,* with which the plate *f, f,* is provided.

It will, of course, be obvious that this apparatus may be applied, with similar effect, in the construction of various kinds of useful cramps. The application of the convolute grooved plate is also peculiarly beneficial in effecting the advancing motion of the cutting tool or boring spindle of all kinds of vertical drilling machines. Fig. 9, represents a front elevation, and fig. 10, a side elevation of a small hand drilling machine, with the improved apparatus attached: *a, a,* is the plate or disc, having the convolute curved groove *b, b,* formed upon it; *c, c, c,* are the upright and cross framings of the machine; *d, d,* the tool socket or boring spindle, which is caused to revolve by the hand winch and mitre wheels *e, e,* and advanced or lowered to its work by means of turning the grooved plate *a, a,* when the convolute curve, acting upon the pins *f, f,* at the back of the sliding bar *g, g,* which is attached to the top of the boring spindle, will thus effect the regular descent of the cutting tool.

As the application of this apparatus is here shown to a hand drilling machine, it will be unnecessary to illustrate its adaptation to larger machines, which are required to be driven by power. The same motion or apparatus is also particularly applicable as a boring head or tool carrier to be used in all kinds of engines for boring cylinders, &c., and as the means of effecting the advance and retreat of the cutting tool and stays; also all kinds of slotting, key-grooving, or morticing engines, and as an advancing power for all descriptions of presses, or for punching or cutting metals, and for securing work to the tables of planing, drilling, morticing, and other machines.

Having now described my improvement in lathes, and its application to some other useful purposes, I consider it unnecessary to mention all the various machines and tools to which it is peculiarly applicable; and, in conclusion, I wish it to be distinctly understood that I make no claim of originality in any of the parts of the apparatus when separate, but I do claim the combination and application of them so as to obtain the motions above described, in reference to lathes, tools, and machinery already alluded to; and also the use of such apparatus in all situations where a similar application may be made.—[*Inrolled in the Rolls Chapel Office, June,* 1837.]

Specification drawn by Messrs. Newton and Berry.

To WILLIAM NICHOLSON, *of Manchester, in the county of Lancaster, engineer, for an invention of certain improvements in the construction and arrangement of preparation and spinning machinery.*—[Sealed 17th June, 1837.]

THE nature of the invention, communicated to me by a foreigner residing abroad, consists, firstly, in an improved arrangement of machinery for preparing the leather, and placing the same on the rollers used in preparation and spinning machinery; and, secondly, in an improved construction or arrangement of machinery for driving the spindles of the preparation machine, known by the name of the bobbin and fly frame, which construction or arrangement is equally applicable to other preparation machines requiring a similar rotation of the spindles; and the manner in which the same is to be performed and carried into effect, is set forth and described in the annexed drawings and the following description, the same letters and figures of reference indicating the same parts throughout the whole of the drawings:—

The first part of my improvements, or that which appertains to the preparing of leather, and covering or placing the same on the rollers, is delineated in various views and sections in Plate XI.; and I shall now proceed to describe the construction and mode of operating with reference to the figures there represented. Fig. 1, represents a front view, and fig. 2, an end view of an improved machine for the purpose of grinding or cutting the surface of leather designed for the purpose of covering rollers, and to reduce it to an equal and uniform thickness, which is essential to the covering of rollers, so as to present a perfect and cylindrical external surface when completed; at the same time producing a rough internal surface on the leather, which prevents its turning on the cloth covering with which the metallic roller is first covered. Fig. 3, is the driving end of the same machine, on an enlarged scale; fig. 5, is the reverse end, and fig. 4, a transverse section; fig. 6, is a perpendicular lateral section through the driving shafts of this machine, and fig. 7, is the same, through the delivering rollers G, G, which will be hereafter explained; fig. 8, is a plan view of the machine.

All these figures having the same letters of reference, it will be easy to refer to that in which the part spoken of in the following description is best seen. Returning to figs. 1, and 2, A, represents a drum placed on the driving shaft of the machine, which receives motion in any convenient manner; and B, is a cross strap, conveying motion to a pulley above on the shaft of the cylinder C, which is constructed of steel, fluted in a lateral direction, with grooves of about one-tenth of an inch distance, and afterwards turned with a spiral groove of the same pitch, so as to form the surface of the cylinder into a rasp or continuous surface of diamond joints.

The way in which this cylindrical rasp is supported will be best seen at fig. 6, one end being secured in the conical support, into which it is forced home by means of the screw C, and the other supported by the screw itself. This cylinder I drive about one thousand revolutions per minute. Immediately above the revolving rasp C, is placed the straight edge D, the position of which is governed and regulated by means of the three screws D^1, D^2, D^3, which determines the distance or space between it and the surface of the revolving rasp C, for the form and construction of which see figs. 4, and 6. Immediately below the revolving rasp C, is placed a circular brush E, which is devolved by means of a strap from the drum A, in an opposite or contrary direction to the underside of the circular rasp C, thereby keeping the rasp clear of any leather or dirt which may accumulate on its surface, as hereafter explained: F, represents a pair of friction rollers, and G, a pair of delivering rollers, which are weighted and geared together, and receive a slow motion by means of bevils through the upright shaft G, driven from the driving shaft by a worm and worm-wheel at G 2; H, and H 1, are rests or circular rods for grinding the leather in the process of preparation.

Supposing a strap, fillet, or continuous length of leather, of a width suitable for the covering to top rollers, to be passed between the friction rollers F, in the direction indicated by the line I, I, (see fig. 4,) over the rests H, and H 1, and under the straight edge D; and, lastly, between the drawing or delivering roller G, it will be uniformly drawn forward in the direction indicated by the arrows, at the same time that its surface is subjected to the rasping action of the cylinder C, the amount of which action is governed by the position of the rest or straight edge D, at the same time that the rasp C, is cleared of dust of leather which may accumulate by means of the revolving brush E, which is driven below, as seen at figs. 1, and 2.

I would here remark, that I have found this method of rasping and equalizing the surface of soft leather suitable for the intended purpose, far superior to any attempts at cutting the same, inasmuch as it is not irregularly stretched, and the rough surface left by this process is desirable in the subsequent operation of placing it firm on the woollen with which the metallic roller is generally first covered.

The leather being prepared by this machine, and in the mode above described, is next cut into suitable lengths, and formed into cylindrical tubes in the ordinary manner, in which form it is forced or placed on the rollers by another machine, which I shall now proceed to describe. Fig. 10, represents a front view, and fig. 11, an end view of the machine in a complete form, driven from the drum K. Figs. 12, 13, 14, 15, 16, and 17, are detached parts of the same machine on an enlarged scale, which will be referred to as I proceed with the description, always bearing in mind that the same letters indicate the same parts throughout: referring to figs. 10, and 11, L, is a loose pulley, driven by a strap from the drum K, below, which either runs free, or is connected with the horizontal screw M, by means of a clutch on the boss, as best seen at figs. 12, and 13. The position of the pulley L, being governed by the pressure of the foot on the treadle N, which tightening the band or cord seen at fig. 1, and forces the horizontal stop rod O, in the direction to connect the pulley L, with the screw M, while the weight P, acting in an opposite direction, disconnects the pulley L, as soon as the pressure on the treadle N, is removed. Parallel, and on each side of the screw M, are placed the two guide rods Q, Q, which carry a small sliding carriage R 1, as best seen at figs. 12, 13, and 16, provided with the horizontal rod or forcer R. In the centre, and connected with this carriage R 1, is placed a pair of plyers or vibrating levers, the lower part of which constitute a nut to correspond with the screw M, when forced together, but which is free of the screw when open, so that when closed or forced together by the levers or arms S, S, (see fig. 16,) and held by the catch with which they are provided, the carriage R 1, is carried forward by the rotation of the screw M, in the direction indicated by the arrow; but when the catch is removed from the arms or levers S, S, and the nut allowed to free itself from the screw M, the sliding carriage R 1, may be run or passed by hand, in the opposite direction: T, represents a series of straight elastic springs, similar to the spring used as the main spring in a watch. These are placed round a common centre, and held firm at one extremity by means of an open nut, the construction of which will be best seen at fig. 14, and the position in which the same are placed, at figs. 10, 12, and 13. Fig. 15, is an enlarged end elevation of the driving end of this machine; fig. 16, a transverse section; and fig. 17, an end view of the opposite end to that at which it is driven.

To operate with this machine, a cylinder or covering of leather must be the first passed over the springs T, the elasticity of which permits it to be run on by hand without any effort, and the carriage R 1, and forcer R, run back free of the screw M, which is at that time freed from the driving pulley L. A roller, properly prepared with woollen or other suitable covering, is then placed in the position U 2, see fig. 10, and the levers S, S, forced together by hand, which bring the nut, at their lower extremity, in contact with the screw M, with which it is held by the catch already described; the foot of the operator is then placed on the treadle N, and the pulley L, connected to the screw M, which traverses the forcer R, forward, and places the roller within the cylindrical leather placed on the springs T;

as soon as it is in the proper position, the operator presses the leather covering by hand, and the roller, along with the leather covering, is forced forward by the part R, and relieved from the springs T, in a finished state. The foot is then taken off the treadle N, and the catch from the levers S, S, and the carriage R 1, moved by hand to its former position preparatory to renewing the same operation. The covered roller being thus forced off the springs T, a new cylinder of leather is placed in the same position.

The second part of my improvements, which consist in an arrangement for driving the spindles of the bobbin and fly frame, and similar preparation machines, is shown at fig. 18, which represents an end elevation, and fig. 19, a plan of two spindles U, U, placed, as they generally are, in two rows in this machine; and W, is an horizontal shaft passing between the spindles the whole length of the machine. This shaft W, is provided with a series of driving wheels X, cut in a peculiar manner, with spiral teeth, as represented in the drawing, which geer into smaller pinions or wheels of the same construction Y, placed on the respective spindles U. Fig. 20, represents an end elevation, and fig. 21, a plan of another modification of this driving apparatus, in which the double face wheel Z, which I name a radial screw wheel, is substituted for two of the wheels X, in the former figures. The construction of the wheel Z, will be clearly seen by reference to the drawings, driving a spindle from each surface, and the effect is very similar to that produced at figs. 18, and 19, except that the difference between the driver and driven wheels is increased. This improved mode of driving possesses all the advantages of bevil or skew gear usually used for the purpose, at the same time that a single shaft W, drives both rows of spindles, instead of requiring a separate shaft to each row of spindles, as in the ordinary arrangement.

Having now described my certain improvements in the construction and arrangement of preparation and spinning machinery, together with some of the advantages derived from the application of these improvements, I declare that I do not claim any common, separate, or well-known part of the machinery described; but I do claim, as regards the first part of my invention, the general arrangement of both machines, together with the application of the quick revolving circular rasp O, in the first machine, and the application of the spring-head, formed by the T, springs in the second machine; and, as regards the second part of my invention, I am fully aware that similar wheels to those represented, have already been constructed and used for various purposes. And I make no claim to the construction of such wheels separately; but I do claim the application and arrangement of such wheels as set forth and described, and as applied to the bobbin and fly frame or similar preparation machines. And such improvements being communicated to me by a foreigner residing abroad, and being, to the best of my knowledge and belief, new, and never before used in that part of her Majesty's dominions called England and Wales, and the town of Berwick-upon-Tweed, I deliver this as a true and faithful specification of the same.—[*Inrolled in the Inrolment Office, December,* 1837.]

To EDWARD COOPER, *of Staverton, in the county of Wilts, clothier, for his invention of an improvement in the making or manufacturing of soap.*—[Sealed 21st April, 1838.]

THESE improvements in the manufacturing of soap consist in the employment of an oleaginous substance extracted from the seeds of the sesamum plant, a native of East India, which is imported into this country in large quantities, in the form of oil, and also in the seeds, which, by compression, yield the oil in very considerable abundance. This oil I use in the same way as olive oil or other oleaginous or fatty matters, by mixing it with alkaline materials in the way that soap is usually made.

The quantity of alkaline materials to be employed with any given quantity of the oil, must depend upon the strength and goodness of the oil, of which practical experience in the art of soap making alone can determine. The soap so produced is much superior in its working properties to other soaps, and can be made at a considerably reduced cost.

The subject, therefore, of my invention, and that of which I claim the exclusive use under the above in part recited Letters Patent, is the employment of the oil obtained from the sesamum plant for the making or manufacturing of soap.—[*Inrolled in the Rolls Chapel Office, October*, 1838.]

Specification drawn by Messrs. Newton and Berry.

To HENRY GOSCHEN, *of Crosby-square, Bishopsgate-street, in the city of London, merchant, for an invention of improvements in preparing flax and hemp for spinning, being a communication from a foreigner residing abroad.* [Sealed 19th July, 1837.]

THIS invention is described in the specification somewhat in the following manner:—Small bundles of flax that have been well combed upon the hackle, which will be hereafter described, are taken and tied round in three or four places, and then placed in a boiler filled with water: the flax must be boiled for an hour, and afterwards rinsed in cold water, and then hung up to dry in the open air. After the flax is well dried, it must be boiled a second time for about an hour, and rinsed in cold water, and dried as before; after which it should be submitted to friction, either by passing it between two revolving rollers, made of wood or other suitable material, or friction may be produced by rubbing the flax between the hands.

It is then submitted to the action of a ley, called by the Patentee, No. 1, and hereafter described. This ley is prepared in a boiler, and when it arrives at the boiling point, the flax is placed in it and boiled for two or three hours. It is from thence removed to a vessel containing hot water, and allowed to remain there for about an hour, after which it is rinsed in cold water; it is then dried in the open air, and rubbed or rolled as above described. The flax is then submitted to the action of the ley No. 2, in which it is boiled for two hours or more, from whence it is removed to a vessel of hot water, in which it remains until the water has become cold; it is then well rinsed in running water, and afterwards dried, and rubbed or rolled as before; and if, after this treatment, the flax should not be found to be of the requisite white colour and fineness, it should be boiled once more for two or three hours, as the case may be, in the ley No. 2, and afterwards rinsed and dried, as before mentioned.

After this is done the bundles of flax must be untied, and all the stalks straightened and glazed with a roller made of wood or other suitable material: this roller must not, however, be too large. The flax must now be combed as softly as possible upon a hackle prepared for that purpose, the two ends being first firmly tied together.

The manner of preparing the leys Nos. 1, and 2, is described in the specification as follows:—To prepare ley No. 1, to twenty-seven tenths of gallons of cold water add two pounds of ashes, (wood ashes, we suppose, though not so stated in the specification,) and about a quarter of a pound of white soap; this mixture is then boiled up several times, after which the flax is put into it. To make the ley No. 2, which is prepared without ashes, one pound of soap must be so entirely dissolved in twenty-seven tenths of gallons of cold water, that not a single particle of the soap should remain unmelted. The boilers used in these processes may be made either of copper or cast iron; their size will, of course, depend upon the extent of the establishment; and it should be observed that the flax must not be pressed down in the boilers too much, so that there may be room enough to stir the bundles about during the boiling process.

The hackle, for combing the flax when in its raw state, should be about ten inches long and four inches wide, and the teeth must be round, and made of pieces of steel fixed in a strong board, and placed about one inch apart from one another. The teeth should be strong enough to prevent them from being easily broken, and they may be about five or six inches long, and stout in proportion. The hackle to be employed for combing the bleached flax need only be about four inches long and two inches wide, and the teeth, in this instance, are made of steel, and may be about one inch and a half long, and of such a thickness that when fifteen of them are placed together, the circumference of their lower end should not exceed one inch; the teeth, in this machine, must be about a quarter of an inch apart. The Patentee now proceeds to describe the treatment to which hemp is subjected preparatory to spinning. The hemp is first carefully separated from the tow and other extraneous matters, and formed into bundles, which are tied round the centre and at both ends, care being taken that they are not too large, or that they are not tied too tight. The bundles of hemp, so prepared, are then put into a wooden tub, and boiling water is poured over them, and the hemp is allowed to remain thus immersed until the water has become cold. The hemp is from thence transferred to a boiler filled with water, in which it must be boiled for three or four hours; it is afterwards rinsed in cold water and dried in the open air, and then again boiled; but it is not necessary to pour hot water over it previous to the second boiling.

This boiling, rinsing, and drying process must be repeated four or five times; and it should be observed, that, after the last time of boiling, the hemp ought to be well rinsed, and dried with great care; and when sufficiently dry, the bundles are to be untied and the hemp combed upon the ordinary hemp hackle; it is then to be arranged in bundles of a moderate size, and tied round in four or five different places, and in this state boiled for five or six hours in the ley No. 1, in the same manner as the flax. This process is repeated from four to six times, according as it may be considered desirable, the hemp having been previously well rinsed in cold water and dried every time before it is submitted to the ley; and after it has acquired the requisite whiteness it must be boiled once in the ley No. 2, for four or five hours, after which it is to be taken out of the boiler and put into a wooden vat or tub, and have boiling water poured over it.

It is then allowed to remain in the vat for two or three hours, and then thoroughly rinsed in clear cold water, and carefully dried; and after this is done, the bundles are to be untied, and the fibres straightened and glazed by being passed between wooden rollers, as is the case with the flax. The hemp is then cut into two or three parts, according to its length, and combed softly on the same description of hackle as that above described for combing the bleached flax, with this difference only, that the hackle for the prepared hemp should have triangular teeth in place of the round ones used in the hackle employed for combing the bleached flax.

The Patentee says, in conclusion, that he claims as his invention, the mode or process of preparing flax and hemp, as above described.—[*Inrolled in the Inrolment Office, January*, 1838.]

To MILES BERRY, *of the Office for Patents*, 66, *Chancery-lane, in the county of Middlesex, patent agent, civil engineer and mechanical draftsman, for a new or improved method of applying certain textile and exotic plants as substitutes, in various cases, for flax, hemp, cotton, and silk, being a communication from a certain foreigner residing abroad.*—[Sealed 14th May, 1838.]

THE textile and exotic plants from which are to be extracted the fibres to be employed as substitutes for flax, hemp, cotton, and silk, are the following:—Firstly, the musa, or the plaintain or banana plant of every kind or variety; secondly, the cannacorus plants of every sort or kind; thirdly, the ficus or fig-trees; fourthly, the agave or aloes of every sort; fifthly, the karatoo plants; sixthly, the ananas or pine-apple plant; seventhly, the cocos or cocoa tree plants; eighthly, the palmæ or palm tree; ninthly, the macau tree or plant; tenthly, the phornium tenax, or New Zealand flax; and, eleventh, the saccharum officinarum, or sugar canes; and in general all the textile plants which grow between the tropics, and where the following processes of preparation are to be performed, so as to render them fit and proper for exportation to this country, and prepared ready for use, thereby obviating the necessity of transporting or bringing them over in the rough or natural state, with all the useless, unnecessary, or extraneous matters which are not wanted with the fibres, as hitherto has been the case, and which extraneous matters are much easier and better extracted or separated from the fibres when in the green state, or when fresh gathered in the country where they grow, than when dried and exported in the ordinary manner.

The fibres of the above textile or exotic plants are to be extracted either by steeping them in water, and making them ferment, or by passing or crushing them between fluted cylinders or rollers, by pounding, falling, pressing, or grinding them, which operations disengage the fibres from the gluten, resinous, or other vegetable matters which bind the fibres together.

When the fibres are thus extracted, they are to be bleached, by boiling them in water, or alkaline, chloride, or other chemical bleaching solutions, heated by a naked fire, or by a steam bath, and then washed in clean water.

These substances being thus washed and bleached, are to be well-dried, and packed up in bags or barrels for exportation from the places where they grow.

The fibres thus prepared are to be combed, heckled, and dressed in the way usually employed for hemp and flax, and are to be used either separately; that is to say, each sort by itself, or mixed together, to make ropes and cables, which are to be manufactured by the ordinary processes, and are to be coated with tar, or are to be employed without any coating, according to the use they are intended for. Such ropes may be used as substitutes for hemp ropes in the erection of buildings, in mines, in agriculture, in machinery, and other like purposes.

The fibres which are most brilliant in appearance, or those that are the softest and most glossy, are to be used for making plain or raised tissues, which may be dyed in every colour, and also for making ornamental ropes for looping up curtains, bell-pulls, cords, tassels, and trimmings; shooting bags, girths, and a great number of fancy articles imitating silk or cotton.

The refuse, or coarsest fibres, may be employed either for making coarse ropes, cables, strings, and the like, or may be reduced into pulp for making paper, and are thereby a further substitute for flax, hemp, and cotton.

If the fibres of the above plants were to be extracted merely for making paper, the said plants might be cut up into pieces by the machinery generally used for chopping carrots, turnips, beetroot, &c.; or they might be treated whole, in the manner above stated.—[*Inrolled in the Rolls Chapel Office, November,* 1838.]

Specification drawn by Messrs. Newton and Berry.

To John Pearse, *of Tavistock, in the county of Devon, ironmonger, for his invention of an improvement or improvements in the construction of wheels.*—[Sealed 19th July, 1837.]

This invention is a method of applying wooden spokes to wheels, in such a manner that they may support the downward pressure of the load when below the axletree; and when the weight is above the axletree, they sustain the carriage by the property of suspension. The way in which they are caused so to act, is by permanently fixing the spokes to the felloes, and also to the naves of the wheel. In addition to the spokes, the Patentee applies certain diagonal stays, by means of which he is enabled to make upright wheels of a more durable kind and of greater strength than has heretofore been accomplished.

Fig. 5, Plate X., represents a side view of a wheel, and fig. 6, a transverse section, constructed according to the present improvements: *a, a,* are the regular spokes, to which are adapted diagonal stays *b, b,* for taking off part of the strain: the ends of the spokes that are fixed in the felloes *c, c,* are constructed in such a manner by dovetailing, that they may sustain the load without its being possible to draw them towards the nave by the load. The spokes are fixed to the felloe by pins or dowels of iron, in addition to the ring of tire.

The Patentee concludes his specification by saying, that he lays no claim to the parts separately; but what he claims as his invention, is the mode herein described, of constructing and applying wooden spokes with diagonal stays, to the felloes of wheels, in such a manner as to act on the double principle of sustaining the weight of the load from above, by suspension, and from below the nave by propping, and for the mode of applying the diagonal stays to take the strain of the load on the wheel.—[*Inrolled in the Inrolment Office, January,* 1838.]

SCIENTIFIC NOTICES.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from p. 175.)

May 1, 1838.

JOSHUA FIELD, V. P., in the chair.

On Huddart's Rope Manufacture. By George Drysdale Dempsey.

The above communication on the improvements in rope manufacture, introduced by the late Captain Huddart, contains a general account of the successive improvements introduced, and a description of the machinery invented by that celebrated man, and erected at Limehouse.

It is accompanied by ten sheets of drawings of the machinery.

The preceding communication having been laid before the meeting, a discussion took place on the relative strength of the cables of Huddart's and the ordinary manufacture. The strength of two-inch rope of Huddart's, when compared with that of the ordinary manufacture, is as 8 to 5¼. The increase of strength was greater for large ropes than for small. The best test of the wear of ropes are those of mines. A five-inch Huddart's rope has been found to last twice as long as a six-inch rope; the weight of the former is much less, consequently there is a great saving in power as well as in durability. It was stated that there was danger of the tar being of such a temperature as to char the yarns; tar of the temperature of boiling water was the best.

May 8, 1838.

The President in the chair.

On Huddart's Rope Machinery. By E. Birch.

In this communication the author has described the general mode of manufacture, prior to the improvements introduced by Captain Huddart, and the establishment of the works at Limehouse.

It is accompanied by fifteen sheets of drawings of the machinery.

On the relative Heating Powers of Coke and Coal in Melting Glass. By Apsley Pellatt, Assoc. Inst. C. E.

The object of this paper is to confirm some statements of Mr. Parkes, as to the calorific power of coke and coal from experience of the author's in melting glass. The great loss of heat arising from the flame and unconsumed gaseous portions of the fuel being driven up the flues, when the furnaces are heated by coal, and the fact that coke succeeds better than coal in annealing glass, determined the author to persevere for a month in heating the furnaces with coke, and to compare the result with those obtained when the best coal was employed.

The construction of the furnace and the arrangement of the pots and flues are described. The furnace is somewhat reverberatory, being between an air furnace and an oven; the smoke and flame not escaping at the top, but being drawn to flues betwixt the pots, which are set round in a circle. For the purpose of obtaining sufficient heat about the points and sides of the pots, there are small holes, called "bye-holes," through which the flames should play outward in a length of 5 or 8 inches. The healthful action of the furnace is indicated by the length of the flame issuing from the bye-holes and tops of the flues. Great care is requisite in regulating the supply of air, too much air endangering the pots, too little checking the heat of the furnace. The bars were obliged to be placed at 2 inches apart instead of 1½; the greater concentrated heat of the coke not only requiring more air, but having a tendency to melt the bars: lumps of fire-brick also were thrown in to supply the deficiency of clinkers. To make, however, the flues and bye-holes draw well, it was necessary to use ⅕th of screened coals with ⅘ths of good coke, by measure. The following is the result:—For nine months the consumption of coals for a 7 pot furnace was 18 tons per week. For four months, on the new system, the consumption was 10½ tons of coke and 5 tons of screened coals per week. Deducting then these 5 tons, it appears that 10½ tons of coke are of the same value as 13 tons of coal, or there is a saving of near 20 per cent. in the weight of fuel, and a superiority of 25 per cent. in the heating power of coke above that of coal. Considerable advantage is also derived from the saving of the pots and in other incidents peculiar to the manufacture of glass.

Mr. Parkes observed that the preceding statements had more than confirmed his results. From the statements of Mr. Pambour, on whose data his calculations had been founded, it appeared that gas coke was inferior to Worsley coke by 12½ per cent.; in his reasonings he had allowed 20 per cent. as the difference betwixt good coke and coal; but according to the results given by Mr. Pellatt, that allowance ought to be 32½ per cent. He was of opinion that the advantage to be ascribed to the screenings was part chemical and part mechanical. The coal would fill up the interstices of the coke, and prevent the air from escaping unconsumed.

Mr. Pellatt remarked, that the safety of the pots was a very important consideration. By the terms hard and soft coke, he understood foundry and gas coke; the former gave a much more intense heat, and lasted longer. The coke he had used was gas coke, and about 14 cwt. to the chaldron. Mr. Fox stated that the coke in use on the London and Birmingham Railway is about the same weight. It was stated that coal which lost ¼th in the weight gained ¼th by coking.

May 15, 1838.

Joshua Field, V. P., in the chair.

Mr. Brunel stated that they were at present more inconvenienced by fire than by water. Some of the gases which issue forth ignite very rapidly; and the reports from Guy's Hospital stated some of the men to be so injured by breathing these gases, that small hopes were entertained of their recovery. The explosions are frequent, and put out the candles of the workmen; but the largeness of the space prevents their being dangerous. The thickness of made ground above them is about eighteen feet. He conceives that these deleterious gases issue from the mud of the river; they proceed from a corner at the top. They had used chloride of lime, but without any great success; there appeared no remedy for the inconvenience. The breathing the gas produces sickness.

A communication was read from Mr. Timperley, of Hull, on the explosion of the boiler of the Union steam-packet at that place last summer. This was attributed to the water in the boiler having become so far reduced as to lay bare the tops of the flues, which would probably be heated to a very high temperature. Water coming in contact with them in this state, on a slight lateral motion of the vessel, steam of sufficient intensity to produce the effects described might be produced.

Mr. Macneill stated, that the boiler plates had, in the above instance, been rent across like a sheet of paper. There was not a single rivet broken.

A long discussion took place on the causes to which these extraordinary effects could be referred: the violence of the explosion on bursting, appearing greater than could be referred simply to the pressure of the steam. If the water were supposed to be decomposed by contact with the hot plates, some of the oxygen would be absorbed by the metal, and the proportion requisite for an explosive mixture destroyed. But there were great difficulties in conceiving the decomposition of water by the plates of a boiler. The commission of the Franklin Institute concluded this to be impossible.

It appeared then that there were grounds for doubting the fact of the presence of oxygen, such as would cause an explosion. And it seemed almost unnecessary to resort to any such explanation, as the sudden generation of steam of high elasticity would produce a pressure sufficient to blow out or rend the boiler in the weakest part, before the pressure could be transmitted through the steam to the safety valve. The transmission of pressure through an elastic fluid, requires time, but the action on the solid is instantaneous.

Steam Expansion Table. By George Edwards, M. Inst. C.E.

A paper by Mr. Edwards was read, descriptive of the principle and method employed in dividing his steam expansion table, an account of which had been laid before the Institution last session.

May 22, 1838.

The President in the chair.

The minutes of conversation on the explosion of steam boilers having been read, considerable doubts were expressed as to the probability of the formation of an explosion under the circumstances in the interior of the boiler. It was suggested, whether a large portion of hot surface might not become suddenly exposed by the cracking off of the incrustation on the sides of the boiler. The metal expands more rapidly than the incrustation; portions of the latter may crack off, and expose a large extent of hot surface to the steam and water: a sudden increase in the elastic force of the steam would necessarily ensue. The incrustation is itself a bad conductor of heat.

Mr. Field, in reply to a question respecting the rapid decay of the bottoms of copper boilers, stated, that copper is very rapidly injured by repeated heatings, and will not long bear high degrees of temperature.

Mr. Cubitt stated that he had not known of any case of explosion of a boiler containing plenty of water. With respect to a recent accident in America, which had taken place soon after the boat had started, he thought that a boiler was more likely to be short of water at starting than at any other time; for the steam will probably have been blowing off for some time, and the men neglected to supply the boiler; whereas, after the vessel has started, the pumps worked by the engine supply the boiler. He should think that a boiler is more likely to be short of water before or just after starting, than at any other time.

Mr. Field stated that the vessel had stopped, and the explosion took place while taking up a passenger: the safety valve had been held down. In all these cases of explosion the difficulty which he experienced was, how to account for the pressure being suddenly increased by the amount which must be supposed. It did not appear to him sufficient to suppose that water flowed over hot flues. If the whole of the top of the fire-place were red hot, this could not produce the effect. The steam boilers in America are generally of a form ill-adapted to resist pressure.

Mr. Buddle stated, the only clearly ascertained fact seemed to be, that these explosions took place when the boilers are dry. He had a case of twin boilers, standing side by side: the dry one exploded; no cause could possibly be assigned, but that it was dry. The steam communication betwixt the boilers was free, by a pipe *eight* inches diameter. It was not a collapse; and the boiler was torn into a thousand pieces. There are two distinct cases; the one a rent or bursting, the other an explosion, in which the parts are thrown to a considerable distance.

Mr. Cubitt called attention to the remarkable case mentioned by Mr. Buddle, of two boilers connected together by a steam pipe of eight inches diameter, the communication free betwixt them, but one short of water; the other having its proper quantity of water. The dry boiler blew up with a great explosion, the other remaining uninjured. The steam was blowing off at the time. With respect to the nature of the report, Mr. Buddle stated that he had not himself heard it, but it was represented as sudden and short: any representation of this nature cannot be depended on, as two persons situated in different positions will give very different accounts. This had occurred to his knowledge on the explosion of a coal mine. He was close by, and thrown down; the report was smart like that of a six-pounder; at two miles off it was like a peal of thunder, shaking the houses and throwing down the furniture. One peculiar feature in the explosion of the steam boilers is, the rending and crumpling up of the boiler plates. The plates are rent and twisted as if of paper.

List of Patents

Granted in Scotland between 22d November and 22d December, 1838.

To Robert Beart, of Huntingdon, miller, for improvements in apparatus for filtering liquids.—27th November.

— Auguste Victor Joseph Baron De Asda, of Millman-street, Bedford-row, in consequence of a communication made to him by a foreigner residing abroad, for improvements in producing or affording light, which he intends to denominate a solar light. —29th November.

— John Barnett Humphreys, civil engineer, for improvements in marine and other steam engines.—29th November.

To Richard Lamb, of David-row, Southwark, for improvements in apparatus for supplying atmospheric air in the production of light and heat.—29th November.

— James Timmens Chance, of Birmingham, glass manufacturer, for improvements in the manufacture of glass.—29th Nov.

— Paul Chappe, of Manchester, spinner and manufacturer, for certain improvements in the means of consuming smoke, and thereby economising fuel and heat in steam engine or other furnaces or fire-places, which improvements are also applicable in preventing the explosion of boilers.—30th November.

— Samuel Seaward, of the Canal iron-works, Poplar, engineer, for certain improvements in marine steam engines.—30th November.

— Henry Davies, of Stoke Prior, engineer, for certain improved apparatus or machinery for attaing mechanical power; also, for raising or impelling fluids, and for ascertaining the measure of fluids.—1st December.

— Joseph Bolton Doe, of Hope-street, Whitechapel, iron-founders, for improvements in apparatus in the manufacture of soap. —1st December.

— Fauquet Delarue, jun., late of Duville, near Rouen, France, now at the London Coffee-house, London, for certain improvements in printing and fixing fast, red, black, and other colours upon cotton, silk, woollen and other fabrics, without the usual process of dyeing.—11th December.

— Theodore Cotette, of the Haymarket, London, civil engineer, for improvements in extracting the salt from sea or salt water, and rendering it pure or drinkable, and in purifying other water.—14th December.

— Henry Adcock, of Mount-place, Liverpool, civil engineer, for certain improvements in the raising water from mines and other deep places.—14th December.

— William Thorp and Thomas Meakin, of Manchester, silk manufacturer, for certain improvements in looms for weaving; and also a new description of fabric to be produced or woven therein.—14th December.

To William Crofts, of Radford, machine maker, for improvements in the manufacture of lace.—14th December.

— Joseph Green, of Ranelagh-grove, Chelsea, for an improvement in ovens.—21st December.

— Thomas Nicholas Raper, of Greek-street, Soho, for improvements in rendering fabrics and leather waterproof.—21st Dec.

— John Howorth, of Aldermanbury, London, manufacturer, partly in consequence of a communication from a certain foreigner residing abroad, and partly by invention of his own, for certain improvements in machinery for spinning, roving, doubling, and twisting cotton and other fibrous materials.—21st December.

New Patents
SEALED IN ENGLAND.
1838.

To John Small, of Old Jewry, merchant, for improvements in the manufacture of thread or yarn and paper, by the application of certain fibrous materials not hitherto so employed.—Sealed 1st December—6 months for inrolment.

To Peter Taylor, of Birching Bower, in the county of Lancaster, rope-maker and slate-merchant, for improvements in machinery for propelling vessels, carriages and machinery, parts of which improvements are applicable to raising of water.—Sealed 1st December—6 months for inrolment.

To Ambrose Bowden Johns, of Plymouth, artist, for his invention of improvements in colouring or painting walls and other surfaces.—Sealed 1st December—6 months for inrolment.

To James Hartley, of Bishop Wearmouth, glass manufacturer, for his invention of improvements in the manufacture of glass.—Sealed 1st December—6 months for inrolment.

To Theodore Cotette, of the Haymarket, civil engineer, for improvements in extracting the salt from sea or salt water, and rendering it pure or drinkable, and in purifying other water.—Sealed 1st Dec.—6 months for inrolment.

To John Player, the younger, of Loughor, near Swansea, Glamorgan, for improvements in furnaces and fire-places, for consuming anthracite and other fuel, for generating steam, evaporation, smelting and heating iron and other metals.—Sealed 1st December—6 months for inrolment.

To William Pontifex, of Shoe-lane, in the city of London, coppersmith, for improvements in apparatus and materials employed in filtering and clarifying waters and other liquids.—Sealed 1st December—6 months for inrolment.

To John M'Curdy, of Tonbridge-place, New-road, Esq., for an improved method or methods of generating steam, and applying the same to the evaporation and boiling of fluids, which method or methods is or are applicable to steam engines and other purposes where steam is or may be applied.—Sealed 1st December—6 months for inrolment.

To Stanislaus Darthez, of Austin-friars, in the city of London, merchant, for certain improvements in the construction and arrangement of axles, axletrees, and the naves of wheels for carriages.—Sealed 1st December—6 months for inrolment.

To John Shaw, of Glossop, brass-worker, for his invention of certain improvements in the arrangement and construction of wind musical instruments.—Sealed 1st December—6 months for inrolment.

To Luke Hebert, of Camden-town, civil engineer, for an improved mode or modes of fastening trousers and other parts of dress or apparel, being a communication.—Sealed 1st December—6 months for inrolment.

To Daniel Chandler Hewitt, of Store-street, Bedford-square, professor of music, for certain improvements in musical instruments.—Sealed 6th December—6 months for inrolment.

To John Chisholm and Marin Hyppolite Bellemois, of Pomeroy-street, Old Kent-road, manufacturing chemists, for improvements in treating massicott, litharge, and other compounds of lead, for the purpose of obtaining therefrom silver and certain other products.—Sealed 6th December—6 months for inrolment.

To Godefroy Cavaignac, of Tavistock-row, Covent-garden, gentleman, for improvements in apparatus for transporting materials for various purposes from one place to another, particularly applicable to road-cutting and embankments.—Sealed 6th December—6 months for inrolment.

To Thomas Sweetapple, of Cotteshall-mill, Godalming, paper-maker, for an improvement or improvements in the machinery for making paper.—Sealed 6th December—6 months for inrolment.

To Frederick Neville, of Pancras-lane, in the city of London, gentleman, for an improved method or process of manufacturing coke, whereby the sal-ammoniac, bitumen, gases, and other residual products of coal are at the same time separately collected, and the heat employed in the process is applied to various other useful purposes.—Sealed 6th December—6 months for inrolment.

To Miles Berry, of the Office for Patents, Chancery-lane, patent agent, for improvements in the means of and apparatus for manufacturing gaseous liquids, and for filling bottles and other vessels used for holding the same and retaining the contents therein, and emptying the same when required, being a communication.—Sealed 6th December—6 months for inrolment.

To James Carson, of Liverpool, M.D., for a new mode of slaughtering animals intended for human food.—Sealed 12th December—6 months for inrolment.

To Thomas Robinson Williams, of Cheapside, civil engineer, for certain improvements in machinery for spinning, twisting or curling, and weaving horse-hair and other hairs, as well as various fibrous substances.—Sealed 12th December—2 months for inrolment.

To Henry Count de Crony, of the Picardy, in the kingdom of France, now residing at 14, Cambridge-street, Edgeware-road, for certain improvements in filtration, being a communication.—Sealed 12th December—2 months for inrolment.

To John Alexander Elzear Degrand, of the Boulevart du Temple, Paris, now residing in Paul's-chain, in the city of London, civil engineer, for improvements in the production of motive power, and in machinery for applying the same to useful purposes.—Sealed 12th December—6 months for inrolment.

To James Gardner, of Banbury, ironmonger, for improvements in cutting Swedish turnips, mangel-wurzel, and other roots used for food for sheep, horned cattle, and other animals.—Sealed 12th December—6 months for inrolment.

To Thomas Vaux, of Woodford, land-surveyor, for improvements in tilling and fertilizing land.—Sealed 15th December—6 months for inrolment.

To Crofton William Moat, of Putney, for an improved mode of applying horse power to carriages on ordinary roads.—Sealed 17th December—6 months for inrolment.

To Barclay Farquharson Watson, of Lincoln's-inn-fields, solicitor, for improvements in crushing or preparing New

Zealand flax (phormium tenax).—Sealed 17th December—6 months for inrolment.

To Edwin Edward Cassell, of Mill-wall, Poplar, for improvements in lamps.—Sealed 17th December—6 months for inrolment.

To Job Cutler, of Lady Pool-lane, Birmingham, gentleman, for improvements in combinations of metals applicable to the making of tubes or pipes, and to other purposes, and in the method of making tubes or pipes therefrom, which improved method is applicable to the making of tubes or pipes from certain other metals and combinations of metals.—Sealed 17th December—6 months for inrolment.

To James Lees, of Salem, near Oldham, in the county of Lancaster, cotton-spinner, for an improvement in the machinery for spinning, twisting, and doubling cotton, silk, wool, hemp, flax, and other fibrous materials.—Sealed 17th December—6 months for inrolment.

To John Hawkshaw, of Manchester, civil engineer, for his invention of certain improvements in mechanism or apparatus applicable to railways, and also to carriages to be used thereon.—Sealed 17th December—6 months for inrolment.

To Benjamin Goodfellow, of Hyde, in the county of Chester, mechanic, for certain improvements in machinery or apparatus for planeing or cutting metals.—Sealed 18th December—6 months for inrolment.

To John Roberts, of Manchester, machine-maker, for certain improvements in machinery or apparatus for planeing or cutting metals.—Sealed 18th December—6 months for inrolment.

To John Radcliffe, of Stockport, machine agent, for the application of an improved covering for the rollers used in the several processes of preparing, drawing, slubbing, roving, spinning, twisting and doubling of wool, cotton wool, flax, silk, mohair, or any other fibrous material or substance, or so many of such rollers as require, or are deemed to require covering for such several processes, or any of them.—Sealed 19th December—6 months for inrolment.

To Joseph Lambeau, of St. Paul's Church-yard, chemist, for improvements in rotatory engines, being a communication.—Sealed 19th December – 6 months for inrolment.

To Andrew Smith, of Princes-street, Leicester-square, engineer, for certain improvements in apparatus for heating fluids and generating steam.—Sealed 20th December—6 months for inrolment.

To Samuel Parker, of Argyle-place, lamp-maker, for improvements on stoves.—Sealed 20th December—6 months for inrolment.

To Carl Augustus Holm, of Mincing-lane, engineer, and John Barrett, of Vauxhall, printer, for certain improvements in printing.—Sealed 20th December—6 months for inrolment.

A grant in pursuance of the report of the Judicial Committee of her Majesty's Privy Council, unto Daniel Stafford, of 25, St. Martin's-le-Grand, in the city of London, gentleman, for certain improvements on carriages, being an extension for the term of seven years from the 24th day of December, instant, of Letters Patent granted by his late Majesty, George IV., to the said Daniel Stafford, for the said invention.—Sealed 21st December.

CELESTIAL PHENOMENA, FOR JANUARY, 1839.

D.	H.	M.	
1			Ceres greatest hel. lat. N.
			Clock before the sun, 3m. 43s.
	—		☽ rises 5h. 26m. A.
	—		☽ passes mer. 1h. 1m. M.
	—		☽ sets 9h. 40m. M.
			Encke's Comet R. A. 17h. 32m. dec. 27. 59.
			Ditto passes mer. 22h. 49m.
	14	35	☿ in conj. with ♀ diff. of dec. 3. 8. N.
3	0	7	☿ in inf. conj. with the ⊙
5			Clock before the sun, 5m. 31s.
	—		☽ rises 10h. 28m. A.
	—		☽ passes mer. 4h. 10m. M.
	—		☽ sets 10h. 46m. M.
			Encke's Comet R.A. 17h. 54m. dec. 28. 39.
			Ditto passes mer. 22h. 55m.
	18	23	♂ in conj. with the ☽ diff. of dec. 3. 10. N.
6	18	22	♃'s first satt. will im.
	19	49	Pallas in □ with the sun.
7	2	0	☽ in Apogee.
	9	5	☽ in □ or last quarter.
	13	14	♃ in conj. with the ☽ diff. of dec. 3. 26. N.
	15	13	Ceres in □ with the sun.
			Occul. 58 Verg., im. 12h. 20m. em. 13h. 19m.
8	3	29	♃ in □ with the sun.
9	2	39	☿ greatest hel. lat. N.
			Occul. Libræ, im. 17h. 54m. em. 18h. 19m.
10			Clock before the sun, 7m. 43s.
	—		☽ rises 3h. 14m. M.
	—		☽ passes mer. 7h. 33m. M.
	—		☽ sets 11h. 42m. M.
			Encke's Comet R. A. 18h. 19m. dec. 29. 1.
			Ditto passes mer. 23h. 1m.
			Occul. 1 Scorpii, im. 19h. 49m. em. 20h. 51m.
11	14		♄ in conj. with the ☽ diff. of dec. 6. 38. N.
13	4	39	♀ in conj. with Juno, diff. of dec. 8. 28. N.
	13	39	☿ in conj. with the ☽ diff. of dec. 8. 3. N.
14	0	31	♀ in Aphelion.
	4	6	☿ stationary.
15			Clock before the sun, 9m. 38s.
	—		☽ rises 8h. 36m. M.
	—		☽ passes mer. 0h. 7m. A.
	—		☽ sets 3h. 44m. A.
			Encke's Comet R. A. 18h. 43m. dec. 29. 1.
			Ditto passes mer. 23h. 4m.
	2	53	Ecliptic conj. or ● new moon.
	4	34	Pallas in ascending node.
	14	16	♀ in conj. with the ☽ diff. of dec. 3. 2. N.
15	14	43	♃'s first satt. will im.
17	—		Mercury R. A. 18h. 19m. dec. 20. 50. S.
	—		Venus R. A. 20h. 26m. dec. 20. 30. S.
	—		Mars R. A. 12h. 1m. dec. 3. 17. N.
	—		Vesta R. A. 6h. 12m. dec. 23. 8. N.
	—		Juno R. A. 20h. 12m. dec. 12. 47. S.
	—		Pallas R. A. 13h. 8m. dec. 6. 53. S.
	—		Ceres R. A. 13h. 29m. dec. 3. 36. N.
	—		Jupiter R. A. 13h. 9m. dec. 5. 55. S.
	—		Saturn R. A. 16h. 23m. dec. 19. 48. S.
	—		Georg. R. A. 22h. 47m. dec. 8. 31. S.
	—		Mercury passes mer. 22h. 32m.
	—		Venus passes mer. 0h. 41m.
	—		Mars passes mer. 16h. 14m.
	—		Jupiter passes mer. 17h. 22m.
	—		Saturn passes mer. 20h. 35m.
18	6	52	Pallas in conj. with ♃ diff. of dec. 0. 46. S.
	7	19	♅ in conj. with the ☽ diff. of dec. 0. 47. N.
19	4		☽ in Perigee.
20			Clock before the sun, 11m. 16s.
	—		☽ rises 10h. 7m. M.
	—		☽ passes mer. 4h. 25m. A.
	—		☽ sets 11h. 2m. A.
			Encke's Comet R. A. 19h. 4m. dec. 28. 45.
			Ditto passes mer. 23h. 5m.
22	11	18	☽ in □ or first quarter.
	13	55	♃'s third satt. will im.
	16	37	♃'s first satt. will im.
	16	40	♃'s third satt. will em.
23	6	51	Vesta in the ascending node.
25			Clock before the sun, 12m. 36s.
	—		☽ rises 11h. 52m. M.
	—		☽ passes mer. 8h. 52m. A.
	—		☽ sets 4h. 47m. M.
			Encke's Comet R. A. 19h. 2m. dec. 28. 18.
			Ditto passes mer. 23h. 4m.
	14	31	♃'s second satt. will im.
	22	43	☿ greatest elong. 24. 50. W.
26			♃ greatest hel. lat. N.
	15	45	Juno in conj. with the sun.
29	3	41	Ecliptic oppo. or ○ full moon.
	18	30	♃'s first satt. will im.
	20	19	♂ in Aphelion.
			Encke's Comet R. A. 19h. 46m. dec. 27. 45.
31	12	58	♃'s first satt. will im.

J. LEWTHWAITE, Rotherhithe.

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Recent Patents.

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To Robert White, *of Nottingham, lace-maker, for improvements in the manufacture of ornamental lace.*—[Sealed 14th November, 1837.]

My improvements in the manufacture of ornamental lace consist in the application and adaptation to ordinary bobbin-net lace machinery, of certain mechanism or apparatus well known in silk looms, and in the weaving of fancy silk goods, as the Jacquard cylinder or box, with its pierced cards, or moving pattern cards or plates, together with suitable mechanism or apparatus connected therewith, for the purpose of acting upon the warp threads of such machinery, or those threads which extend longitudinally through the piece of goods or fabric in contradistinction to the bobbin and carriage threads, or those which are capable of traversing from selvage to selvage of the lace; such longitudinal or warp threads being wound upon long rollers or warp beams, extending lengthways of the machines; that is to say, my improvements in the manufacture of ornamental lace consist in combining the properties of the Jacquard cylinder, with its pierced cards or such other moving pierced pattern cards or plates, with the ordinary bobbin-net lace-making machinery, together or in conjunction with suitable mechanism or apparatus for acting upon the warp threads of such lace machinery, for the purpose of producing different patterns of ornamental lace-work as the machine performs its motions; such apparatus or mechanism being situated between the Jacquard cylinder and its cards, or other such moving pattern cards or plates, and the warp threads of the said lace machinery, for the purpose of connecting and communicating the motions and operations of the one to the other, and by intercepting or interrupting, or giving suitable motions or movements to particular warp threads of such machinery, cause them to be placed in such different situations to their ordinary places when making plain bobbin-net, as to produce the said ornamental lace, the said intercepted or interrupted motions or movements being given by and obtained from the said Jacquard cylinder, with its cards or other moving patterns or plates, or other pierced barrels or surfaces, and communicated by the said intermediate mechanism or apparatus.

And I would here remark, that I am aware that the Jacquard cylinder, with its pierced cards, have heretofore been applied to lace machinery; but such application and adaptation has been effected for the purpose of acting or operating upon the bobbin and carriage threads, or those which are capable of traversing across the piece of lace or net from edge to edge thereof, and has been effected by picking out or selecting certain of such bobbins and carriages, and withholding them at certain times, or forcing them out of their ordinary places, so as to produce ornamented lace: for instance, the specification of Mr. Samuel

Draper's patent, dated October, 1835, for his invention of improvements in producing plain or ornamental weavings, describes the application of the Jacquard cylinder and cards to a peculiar construction and arrangement of lace machinery, wherein all the threads are placed in bobbins and carriages, one set of which, viz. those which are capable of traversing the piece of lace, are acted upon by the Jacquard cylinder and mechanism; and further, the specification of the patent of Mr. William Crofts, dated September, 1836, for his invention of certain improvements in machinery for making bobbin-net lace, describes a mode of applying and constructing certain levers or pickers, or pushers, and the application of sliding drivers and other mechanism, for the purpose of selecting any of the carriages of bobbin-net machinery, so as to produce different patterns of ornamental work; therefore, I do not mean or intend to claim, as my invention, the mere idea of applying and adapting the Jacquard mechanism to bobbin-net lace machinery generally and particularly, nor the application and adaptation of such mechanism for the purpose of acting or operating upon the bobbin and carriage threads, or those which are capable of traversing the width of the piece from selvage to selvage: but what I claim as my invention of improvements in the manufacture of ornamental lace, is the application and adaptation of the Jacquard cylinder, with the moving pierced pattern cards or plates, in conjunction with the suitable mechanism for connecting and communicating the motions or operations of the same to the warp threads, or those which pass from the warp beam or roller longitudinally throughout the piece of lace, and are not capable of traversing the width of the same, such intermediate machinery or mechanism selecting and acting upon certain or particular of the said warp threads, for the purpose of placing them in such situations as will cause ornamental lace to be formed by the machine. And I make this statement in this part of my specification, in order that the reader may have a clear idea of the nature and intentions of my invention before reading the following description of the mechanism, in order that his mind may be properly prepared for what is to follow, and not have to read through the whole of my specification before he arrives at the statement of what I claim as my invention.

And I will now proceed to describe the drawings hereunto annexed, which are several representations of bobbin-net lace machines, with my improvements applied thereto, and will serve to show the manner of carrying my improvements into effect; although I do not mean or intend to confine myself to the precise form, arrangement, or construction of the parts of the improved or additional mechanism, as these may be varied to suit different kinds of machinery, or the different kinds of work to be produced, or the patterns formed in the ornamental lace.

And I will first proceed to show my improvement applied to a bobbin-net lace machine of the circular comb or circular bolt construction; and next, to such other kinds or classes of lace machines, as will serve to further show and illustrate the manner or method of application and adaptation of my improvements thereto; and I would here remark, that as the ordinary and requisite motions, movements, and operations of the various working parts of bobbin-net lace machinery in the production of lace are so well known, that it will not be necessary for me to describe the same; and I shall, therefore, first point out the several ordinary parts of the machines, and only refer to those movements or operations of the same which are affected or altered at the time the Jacquard and intermediate mechanism comes into operation, and shall more particularly describe the nature and operation of this additional mechanism in effecting the objects of my invention, and point out the times the same came into operation in conjunction with the ordinary working parts of the lace machine.

Plate XII., fig. 1, is an elevation of a single locker double tier circular comb, or circular bolt machine, as seen at the side thereof, with my improvements applied and adapted thereto, part of the mechanism being broken away to expose the interior: the old or ordinary parts of the machine being shown in outline only, and marked with capital letters of reference; and the new or additional mechanism is marked with small italic characters and figures. Fig. 2, is a vertical section of the same, taken in the line *a*, *b*, and seen as looking towards the right hand end of fig. 1; fig. 3, is a partial section or diagram, on a larger scale, showing some of the interior working parts of the machine, with the additional mechanism placed in the required situations: A, A, is the ordinary framework and standards of the machine; B, B, the back and front circular combs or bolts placed on their bars C, C; D, D, are the bobbins and carriages; E, E, the taking up points and their bars; F, F, the locker bars and lockers; G, G, the guides and their bars; H, the warp beam or roller; I, the slea; K, the work bar; L, the work beam; M, the first rotatory shaft, actuated by the crank or handle N, and giving motion, by means of toothed gear, through the intermediate wheel O, to the main cam shaft P, which gives motion, by means of bevil gear, to the vertical shaft Q, carrying the "cut of wheels" and other mechanism for producing the shogging motions of the machine. Upon this shaft is mounted the grooved cam wheel *a*, which actuates and brings into operation the Jacquard mechanism by means of a connecting arm *b*, and rocking levers *c*, *c*, attached to the rocking shaft *d*, turning in proper centre-pin bearings in the framework of the machine. Upon the vertical shaft Q, is also mounted the cam or cut wheel *e*, which gives motion at the required time by means of the arm or lever *f*, to the locker bar *g*, and locker *h*, of the Jacquard mechanism; *i*, is the Jacquard cylinder, with the cards *k*, *k*, passing over it, secured by steady pins or points in the usual manner.

The Jacquard cylinder is mounted, turning on the ends of its shaft, in proper bearings, formed in the ends of the rocking levers *e*, with suitable mechanism for effecting its turning over or parts of revolutions at the required time, as hereinafter described. The Jacquard pattern cards are presented as they are turned over by the cylinder opposite to the ends *l*, *l*, of the sliding rods; which ends are bent or turned on one side, so as to come opposite the pierced holes in the cards. The sliders *m*, *m*, carry the intercepters *n*, *n*, the ends of which stand opposite the spaces between the warp threads. The office of these intercepters is to select the required warp threads, and force them out of their ordinary situations, so that the working parts of the machine shall make ornamented instead of plain net. The sliding rods *m*, *m*, are placed upon fixed bars, *o*, *p*, carrying the guides *q*, *r*; the latter of which serve for the intercepters as well as the sliding bars *m*. The locker acts upon projecting pins or studs *s*, on the underside of the sliders, and is made by means of its connexion with the "cut of wheel" shaft Q, to bring back the sliders and intercepters after they have been operated upon by the cards *k*, and have intercepted and acted upon the warp threads, so as to be ready for the next advancement of the cards and cylinder: *t*, *t*, are springs fixed on to the stationary bar *u*, their ends taking into notches formed on the top of the sliders *m*, for the purpose of retaining the sliders and intercepters in the position in which they are placed by the movements of the Jacquard cylinder and cards.

The mechanism for effecting the turning over of the Jacquard cylinder is placed at the right hand end of the machine: *v*, is a catch lever, having its fulcrum in a pin placed in a bracket extending from the framework of the machine: this catch is made to take hold of the pins *w*, *w*, in the end of the Jacquard cylinder, (see the partial sectional figs. 4, and 5, which show different positions of the mechanism,) by means of the spring *x*, which is attached at one end to the catch lever, and the other to a stationary rod extending from the machine; *y*, is a crutch piece, the leg passing through guide pieces on the side of the rocking levers, and supplied with an expanding spring *z*, for the purpose of returning the crutch piece after it has been depressed on a partial revolution of the cylinder.

The operation of the additional mechanism is as follows:—It is caused to come into action at the proper time, when the particular warp threads are required to be intercepted or interrupted, for the purpose of making ornamental lace by the grooved cam wheel *a*, upon the shaft Q. Supposing the Jacquard cylinder to be forced back with the rocking lever *c*, as shown in the detached partial fig. 5, at the required time, the locker *h*, will have been put into operation by means of its connexion, through its shaft, with the cam wheel on the shaft Q, and caused to turn upon its locker bar in the direction of the arrow, and consequently force the sliders *m*, by means of the pins *s*, back, so that their ends *l*, stand in one line: and as the rocking levers and Jacquard cylinder are forced outward by the cam *d*, the catch *v*, still keeping hold of the pin *w*, will cause the cylinder to turn in the direction of the arrow, into the position shown in fig. 5, or rather more than one-eighth of a revolution, the crutch *y*, and springs *x*, and *z*, giving way to the motion. As soon as the pin *w*, has passed the centre line of the lever *c*, the spring *z*, will force up the crutch piece *y*, and cause it, by pressing upon the pin *w*, to complete the quarter revolution of the Jacquard cylinder. At this time the cam *a*, causes the levers *c*, and Jacquard cylinder again to advance towards the frame, and present a fresh card opposite the ends *l*, of the sliders; and such of them as are opposite the holes pierced in the card will remain quiescent, but those which are opposite the plain or blank surface of the cards will be caused to move inwards towards the warp threads as the cylinder advances; and their intercepters, being situated opposite the spaces between the warp threads, will pass in between them, and intercept or interrupt those particular warp threads required; and by standing in the way of the ordinary racking movements of the warps, will prevent their partaking of the racking motion of the guides; and thus ornamental lace will be formed instead of plain net.

As soon as the requisite movements of the machine have been gone through to dispose of the so intercepted warp threads, and they are at liberty to return to their ordinary position, the Jacquard cylinder will have receded from the ends of the sliders, which will then be forced back by the locker coming into operation as before stated, which will bring the intercepters out from between the warp threads into their former position, ready for the next operation of the Jacquard cylinder and cards.

I have not stated in the above description of the operation of this additional mechanism, the operations or movements of the ordinary working parts of the lace machine in making ornamented lace or net, for the following reasons:—In the first place, I do not wish to confuse my specification with unnecessary or lengthened description of parts and operations which do not belong to the movements or operations of the additional machinery, the object of my invention being to obtain and adapt peculiar mechanism for intercepting or interrupting particular warp threads, or giving peculiar racking motions; which threads, when so operated upon, may be used in different ways; for instance, they may be prevented from partaking of the ordinary shogging motion of the guides, as above stated, or they may have an extra shogging motion given to them by shogging the intercepters, the ordinary guides at such time standing still; or they both may have a shogging motion at one time, and then an alternating shogging motion, as may be required to produce different kinds of ornamented lace or net, or different patterns thereon; all of which will be suggested by any practical "setter up" or "twist hand," when he has once had given him the mechanism and apparatus or means of so intercepting or interrupting and operating upon the particular warp threads he wishes to act upon, to produce the ornamented lace or pattern.

And I would here remark, that if opaque patterns of ornamental work are to be formed upon the lace, I prefer making the opaque work as the groundwork by the motions of the machine; and the plain lace or opaque work which surrounds it, by means of the intercepters or interrupters, as above described.

Figs. 6, and 7, are side and plan views of one of the sliders, detached from the machine, with its intercepter and bent end.Fig. 8, is a partial sectional diagram of the working parts of a double locker machine on an enlarged scale, showing another modification of the application or adaptation of the Jacquard cylinder and its cards, and the intermediate mechanism for giving the requisite motion to the intercepters, which, in this instance, have the warp threads passed through eyelet holes at their ends, and conduct or carry the thread from one set of stump guides, placed above, into another set; which stump guides are capable of having shogging motions given to them, whereby the so intercepted or interrupted warp threads may be moved into any required situation for being acted upon by the ordinary working parts of the machine, so as to make ornamented lace in the regular and required movements of such parts, according to the kind or pattern of ornamental lace to be manufactured. The same letters of reference are marked upon corresponding parts, as in the former figures; and, therefore, it will not be necessary for me to repeat them: H, is the ordinary warp roller or beam; Q, is the fancy warp roller or beam, or that which carries the warp threads intended to be acted upon by the intercepters and the stump guides, for the purpose of intercepting and moving them into the required situation for making ornamental lace: F, are the double locker bars; R, S, are the two rows or bars of stump guides.

The Jacquard cylinder is mounted and actuated in the manner before described; and the sliders are, in this instance, passed through holes in the guides *q*, and *r*, and are furnished with springs a, acting against the guide bar *r*, and loop or pin *s*, for the purpose of bringing the sliders back when released after the fancy or ornamented work has been produced: b, is a stop pin, acting against the loop *s*, for the purpose of keeping the warp threads the required period in the situations they are placed by the slides or intercepters and stump guides, and at the proper time they are released by the following mechanism:—The stop pieces or catches b, are formed on the end of the lever arms c, attached to the rocking bar d, turning in proper centrê pin bearings in the framework of the machine; e, is another lever arm, projecting from the bar d, and connected by the link piece f, to the lower lever g, having its fulcrum h, its other end being furnished with an anti-friction roller, acted upon by the cam i, fixed on the main or other driving shaft; and at the required time for releasing the sliders or warp threads, the roller falls down the inclined plane k, on the cam into the recess l; and when the sliders have been again forced forward by the action of the Jacquard cylinder, the anti-friction roller will pass up the inclined plane m, and by raising the lever g, and with it the catch b, will again lock and secure the sliders and warp threads in the position they are placed by the action of the Jacquard cylinder.

Fig. 9, is another similar section to fig. 8, showing the additional mechanism as applied and adapted to a single tier *fluted roller machine;* and I have shown it applied and adapted to this class or description of machines, as it is the quickest working machine now made. The same letters of reference are marked upon corresponding parts, as in the former figures; and the workings and motions of the mechanism will be understood from the foregoing description; therefore, it will not be requisite for me to repeat the same, but I will point out those parts in which there is a variation: T, T, are the fluted rollers acting upon the carriages of the bobbins; G, G, are the guides which, in this kind of machine, extend upwards near to the combs or bolts, and, therefore, the intercepters *n,* require to be elongated, so as to project above them; and this causes the necessity of elongating the slea guide, in order to steady the motion of the intercepters. In this figure, as in fig. 8, one of the sliders *m,* and intercepters *n,* is shown at its position of rest, its tail end being protruded through the card into the Jacquard cylinder.

Fig. 10, is another similar section of the working parts of a lace machine of the Lever's construction, with the additional mechanism applied thereto, in a similar manner or modification as that last shown and described; and as the same letters of reference are marked upon corresponding parts, as in the last figure, no further description will be necessary; and I will only remark, that as the Lever's machines are commonly constructed with wooden framework, the mechanism may be required to be extended to suit such framework.

And having now shown these several diagrams of different kinds of lace machines, with the additional mechanism applied thereto, I shall proceed to show my improvements as constructed and arranged in connexion with a rotatory pin cylinder or organ barrel applied to lace machines, and then refer to a barrel pierced with the pattern holes for the same purpose, i. e. acting upon the intercepters so as to operate upon the warp threads.

Fig. 11, is another sectional diagram of the ordinary working parts of a double locker machine, showing the improved additional mechanism applied thereto; the same letters of reference being marked upon the old or ordinary parts of the machine, as in the former figures: *a*, is the pin wheel or cylinder, mounted, turning in bearings in the fixed framework of the machine, and receives its racking or interrupted rotatory motion at such times as the tails of the intercepters are lifted off from the barrel by the locker, as hereinafter described; *b*, *b*, are the pattern pins, which are brought, by the rotation of the cylinder, one after the other, under the tail pieces *c*, of bent or angle levers or intercepters *d*, having their fulcrum at the pin *e*, in the guide bar *f*; the warp threads are, as in a former instance, threaded through eyes *g*, in the ends of the intercepters; *h*, *h*, are the fixed guides for the intercepters; *i*, is the locker, attached to the bar *k*; *m*, *m**, are the stump guides, one or the other of which receives the fancy warp threads by the action of the intercepters. The action of the mechanism is as follows:—Supposing the locker *i*, to have lifted all the intercepters, or angle lever guides *d*, the pin wheel will be caused, by its ratchet wheel *l*, to make a small portion of its revolution, say the space between one pin to another; and as the pins are only placed on the cylinder or barrel according to the pattern to be produced, they will stand or be opposite the tails of such intercepters as are wished to be operated upon; and consequently, on the locker *i*, again falling, all those tails of the intercepters which have not pins to support them, will fall on to the plain surface of the barrel or cylinder, as that marked *d* 1, bringing their warp threads between the outer stump guides *m*; whereas those tails which have pins brought under them by the rotation of the cylinder, will be held up as the one shown at *d* 2, in the diagram, and their warp threads will consequently remain in the stump guides *m**, and thus the machine will be made to act upon the different warp threads, so as to make ornamental lace, any required shogging motion being given to either of the stump guides to produce different patterns of ornamental lace.

From the motions and operations of the pattern barrel, with its pins *b*, and ratchet wheel *c*, it will be seen that the same effect may be produced by the means and application of a cylinder or barrel pierced with holes, according to the pattern intended to be produced, the tails *c*, of the intercepters *d*, resting on the surface of the cylinder or barrel as it passes beneath them; and on any of the holes pierced in the cylinder coming opposite the tails *c*, they will fall through the same, and, consequently, their other ends will be made to act upon the warp threads, and when the ornamental work has been produced, they will be raised by the action of the locker *i*, in the manner before described.

And I would here remark, that the pierced cylinder or pin wheel may be applied and adapted to work or operate upon the warp threads in the manner hereinbefore described, as regards the Jacquard cylinder, that is, with an advancing and retreating motion, for the purpose of acting upon the warp threads through the intermediate mechanism; such pin wheel or pierced cylinder at all times receiving its racking or interrupted rotatory motion during the time it is moved away from the tails or ends of the sliders, intercepters, or bent levers, without their rubbing on its surface, being raised by inclined planes.

And further I would remark, that the pierced pattern cards, before described, may be applied and adapted to the tails or ends of the additional mechanism, called the sliders or intercepters, by moving them or sliding them upon a flat surface or table, pierced with holes in a similar manner to the Jacquard box or cylinder, such moving or sliding motion bringing a fresh pattern card opposite the ends of the intercepters at the required time; which arrangement or modification of the mechanism would have the same effect upon the warp threads as the Jacquard cylinder and its cards.

Having now described and ascertained the nature of my invention, and the manner of carrying the same into effect, I would, in conclusion, remark, that it will be seen from the foregoing description, and the drawings referred to thereby, that the principal, novel, or peculiar features of these arrangements and constructions of additional and intermediate mechanism, as applied and adapted to lace machinery for the purpose of making or manufacturing ornamental lace thereby, are, first, the revolving, moving, or travelling "pattern surfaces," as "cards," "plates," or "cylinders," which are kept apart from the ends of the "sliders" or "intercepters" when the charge of "cards" or other "pattern surfaces" takes place, without any rubbing or sliding or friction between these two parts; also, the intermediate mechanism, as "sliders," or "intercepters," or "interrupters," for acting or operating upon the "warp threads," together with their levers, springs, and guides;

and lastly, the use and application of the "stump guides", for receiving and regulating the motions or movements of the "warp threads," when selected, interrupted, or intercepted by the intermediate mechanism, for the purpose of making ornamental lace.—[*Inrolled in the Rolls Chapel Office, May,* 1838.]

To CHARLES WATT, *of Manchester, in the county of Lancaster, lecturer on chemistry, and* THOMAS RAINFORTH TEBBUTT, *of the same place, merchant, for their invention of certain improvements in the manufacture of the oxides of lead, and also of the carbonate of lead.*—[Sealed 5th January, 1838.]

I WOULD first remark, that as carbonic acid does not combine with metallic lead when these bodies are placed in contact with each other, it is necessary that the lead should be converted into a protoxide, and subsequently into a carbonate; and as this fact is well known to all practical chemists, I shall proceed to describe our improvements in the manufacture of the oxides of lead, and also of the carbonate of lead, which consist of three different improved processes for obtaining the white hydrate of protoxide of lead, and converting the same into carbonate of lead; and I shall, therefore, describe these processes separately, and the manner of effecting the objects of our improvements.

Firstly, the metallic lead is to be converted into a protoxide or litharge, in the usual way of manufacturing the said oxide; in which state it may be purchased as an article of commerce, or manufactured as required; or we produce a hydrate of protoxide in the following manner:—

We boil the protoxide or litharge with either of the chlorides of sodium, potassum, or barium, in a state of solution, in a suitable iron or wooden vessel, heated by steam pipes or other convenient manner, until the chlorine in these substances has passed into the oxide of lead, which thereby converted into chloride of lead, which becomes perfectly white, when the process is properly conducted and perfected.

Having now obtained the chloride of lead, we proceed to produce the hydrate of protoxide from the same, by expelling the chlorine by means of sulphuric or nitric acid, thereby converting the chloride of lead into a protoxide of lead combined with either of these acids, which we effect in the following manner:—

We take the chloride of lead, prepared as above stated, and red oxide (usually called red lead), in the proportions of three-fourths of the former to one of the latter: these are placed in a suitable vessel or retort, and to them is to be added concentrated sulphuric acid, in weight equal to about one-third of the whole chloride and red oxide; and we then apply a gentle heat thereto, by means of steam, or in any other convenient manner; which heat is to be continued until all the chlorine is expelled, and the red oxide converted into a white sulphate. The vessel in which this operation is to be performed may be of cast iron, with an earthenware head, so constructed, that the chlorine thus formed may pass into an apparatus, such as is usually employed in making the chlorides of lime, soda, &c.; such apparatus being varied according as the chlorides are intended to be made or formed in a dry or liquid state. We then remove the sulphate which has thus been produced into a wooden vessel or tub, furnished with a cover, and well wash it with pure water, in order to remove therefrom any uncombined sulphuric acid, letting the waste water run off until that remaining with the sulphate is free from acid; we then add by degrees, and at intervals of about ten minutes, a solution of some alkaline or earthy carbonate, choosing such of the latter as are soluble in sulphuric acid, more particularly alumine and magnesia. While adding the solution of alkaline or earthy carbonate, we frequently or continually stir the mixture, continuing the process of pouring in the solution so long as any effervescence continues. The sulphate of lead has now become a white hydrate, containing much carbonate; and in order to ensure the perfect conversion of the whole into carbonate, we cause a current of carbonic acid to pass into the precipitate or mixture, and continue it for about an hour, keeping the vessel in which the operation is performed nearly closed, or covered with slight pressure on the lid, in order to obstruct the escape of the gas, the whole being occasionally agitated or stirred by any suitable means: the usual Woulfe's apparatus is best calculated for this operation, and may be made of wood or earthenware. We generate carbonic acid gas in the usual way adopted for such purposes, which is too well known to require particular description. We then again wash the precipitate, or what may now be called white lead, several times with clear water, in order to remove therefrom the salts which have been formed by the chemical action: the process is now completed, and the white lead fit for use.

In our second process, we proceed as follows:—We take chloride of lead, and place it in an earthenware vessel, or such other material as is not acted upon by nitric acid, and which is furnished with suitable conducting off pipes and receiving vessels: the chloride of lead is here subjected to the action of nitric acid, equal in weight to about one-fourth of the chloride, which may be either concentrated or diluted to one-half or two-thirds of its former strength, adding fresh acid so long as any chlorine passes off from the chloride of lead into the vessels destined to receive it. The retort or vessel containing the chloride of lead and nitric acid, must be furnished with all necessary pipes for applying the acid and conducting off the gas; and, as before stated, is to be constructed of earthenware, glass, or such material as is not acted upon by the acid. This process leaves the lead in the state of hydrate of protoxide, combined with a small portion of nitric acid; which hydrate of protoxide is to be converted into carbonate of lead, after the manner stated in the process first described, that is, beginning with the solution of alkaline carbonate.

Our next, or third process, is as follows:—We first dissolve metallic lead, finely granulated, or its protoxide in nitric acid, diluted in about eight parts by weight of water, in a suitable vessel, as above stated, and apply a gentle heat thereto by means of steam, or in any other convenient manner, until all the lead is dissolved. We then precipitate the lead by any of the well-known alkalies or earths in their caustic state: we prefer lime and barytes, because by adding sulphuric acid to them, they will be precipitated in the solid form, leaving the dilute nitric acid free, to be applied to other useful purposes. We also use acetic acid for dissolving the protoxide of lead, following the same course as with nitric acid. After the precipitate or hydrate of protoxide of lead has been thus obtained, it is to be well washed with clear water, in order to remove therefrom the alkali or earthy salt, formed by the chemical combination: the precipitate is now a white hydrate of protoxide of lead. We then cause a stream of carbonic acid gas to pass into the hydrate of protoxide, by means of the well-known apparatus called Woulfe's apparatus, which is formed of earthenware or wood. The carbonic acid gas is generated or obtained in the usual or common method. The current of carbonic acid gas, upon the white hydrate of lead, is to be continuous, or nearly so, and the mixture is to be agitated by frequently stirring the oxide during the operation, which will be much facilitated if the hydrate and water are kept at about the temperature of 120 degrees. In our improved process, we avail ourselves of the combination of the protoxide of lead which takes place when it is boiled, with oily and fatty bodies, until they are converted into oleates, margarates, and stearates; which conversion or transformation is as well effected by oxide of lead as by any of the alkalies or earths. We then displace the protoxide of lead by an alkali, an earth, or their carbonates, which yield carbonic acid to the lead; while the base combines with the fat acids, a stream of carbonic acid gas being applied to the materials under operation, as before stated, for about an hour, in order to ensure the perfect transformation of the protoxide of lead into carbonate of lead; which carbonate is to be well washed from all adhering salts, or other extraneous matters, as before stated: or we may use dilute sulphuric acid, and boil the mass until all the protoxide of lead is precipitated as a white sulphate, which is to be formed into a carbonate, as already described.

In the foregoing processes, we do not claim the use of nitric acid or acetic acid, as solvents of lead, or its protoxides for the purpose of forming white lead; but we claim the use of sulphuric acid for converting the chloride of lead into a hydrated protoxide of lead, and afterwards into a carbonate of lead, and also the chloride of lead thus used. We likewise claim the precipitating the oxide of lead from the nitric and acetic acids, by caustic, alkalies, or earths, instead of the carbonates, and afterwards removing them, and washing the precipitate before we form them into a carbonate of lead; and we claim the forming the hydrate of protoxide of lead, from whatever acid it is precipitated, into a carbonate of lead, and not, as in the common way, precipitating it from a solvent by means of carbonates of alkalies.

We also claim the use of such particular earths, as lime and barytes, as the nitric and acetic acids may be recovered from them by the mere application of as much sulphuric acid as will just saturate the lime or barytes, and that these acids may then be employed for other useful purposes. We likewise claim the application of hydrate of protoxide of lead, formed, as described, from sulphate or hydrate of lead, for the purpose of being converted into a carbonate; and likewise the passing a current of carbonic acid gas through the hydrate, to effect its thorough transformation into carbonate. We likewise claim the use of the oleates, margarates, and stearates of protoxide of lead, as substitutes for acetic and other acids in the production of carbonate of lead, or white lead, for the purpose of converting the hydrate of protoxide of lead into carbonate of lead.—[*Inrolled in the Rolls Chapel Office, July,* 1838.]

Specification drawn by Messrs. Newton and Berry.

To JAMES GARDNER, *of Banbury, in the county of Oxford, ironmonger, for his invention of certain improvements in cutting Swedish and other turnips, mangel wurzel, and other roots used as food for sheep, horned cattle, and other animals.*—[Sealed 11th January, 1837.]

THIS invention is merely a modification of a former one, for which Mr. Gardner obtained a patent, 28th September, 1834: a copy of this specification will be found in vol. vi., Conjoined Series of our Journal, p. 28, to which we refer our readers, in order that the present invention be more readily understood. The former invention consisted of a cylinder, having cutting knives arranged diagonally across it ; the present, is merely for arranging the cutting edges or knives, either diagonally or in any other suitable manner, upon a *flat* surface, instead of placing them upon the periphery of a cylinder. The arrangement of machinery for putting the cutting knives or edges into action, is, of course, different from the former, but that constitutes no part of the invention.

In this instance, the cutting frame, with the knives, slides in grooves or guides, and is made to move up and down by means of a crank, to which a fly wheel and winch is attached, the roots being pushed forward by the workman as he turns the handle.

The Patentee says, at the conclusion of his specification, "Having now described the nature of my invention, and the method of performing the same, I wish it to be understood that what I claim as my invention is the new mode of applying the cutting edges or knives, whereby I am enabled to construct a machine suitable for cutting turnips and other roots much cheaper than when such knives are applied, as in my former patent, to a revolving cylinder; which improved machine will be particularly useful where the quantity of roots to be cut is not large, or where more time can be allowed for cutting them."—[*Inrolled in the Inrolment Office, July,* 1837.]

To JOHN LOACH, *of Birmingham, in the county of Warwick, brass-founder, for his invention of improvements in roller-blind furniture, and in the mode of manufacturing the same, part of which improvements are applicable to other purposes.*—[Sealed 5th October, 1837.]

THESE improvements apply to pulleys for window blinds, and consists in two particulars: first, the construction of a peculiarly-formed piece of metal, intended to act as a wedge within the groove of the frame in which the pulley slides, for the purpose of tightening the pulley in any part of the groove to which it may be slidden; and, secondly, a mode of constructing the pulley or cord roller from two pieces of plate metal, stamped to the required form, and pressed together.

Plate XIII., fig. 13, represents a section of the frame or box *a*, in the pulley slides; *b*, is the base or block of the pulley, having grooves cut in its sides to enable it to slide up and down upon the front edges of the frame or box; *c*, is the pulley intended to carry the cord of the window blind, which pulley turns freely upon a stud extending out from the front of the block *b*, and is secured by a button, or, if desired, by an ornamental disc *d*, screwed upon the stud. Behind the block *b*, there is a sliding piece *e*, having a wedge-formed back: this piece *e*, moves up and down freely in the stationary frame or box *a*, with the pulley; but when the pulley has been drawn down sufficiently far to tighten the cord of the blind, the elasticity of the cord pulls up the block *b*, against the wedge-formed back of the piece *e*, and causes them to be held tightly in the box or frame. When the tension of the cord is required to be relaxed, the thumb and finger applied to the nib at top of the piece *e*, will raise the wedge pieces, and relieve the pulley.

Fig. 14, shows in section two pieces of plate metal pressed into forms suited to construct a pulley or roller. These pieces, when pressed together, locked into each other, and thereby form the pulley as shown in section at fig. 15.—[*Inrolled in the Inrolment Office, April,* 1838.]

To Edward Stolte, *of Arundel-street, Strand, in the county of Middlesex, Esq., for his invention of improvements in making sugar from sugar-cane, and in refining sugar.*—[Sealed 24th February, 1838.]

The constituent parts of this invention are, the application of a new chemical agent, to be used for destroying any colouring matter that may be found in sugar. Animal charcoal has been very generally employed for this purpose for some time, and is now in very common use. The decolouring qualities of sulphurous acid are also already sufficiently known, and, therefore, need not be further noticed here; but another great advantage which may be derived from the use of this agent, for neutralising the colouring matter in sugars which have been previously operated upon by lime, is, that the alkali is precipitated by the sulphurous acid, and prevents any fermentation of the saccharine matters from taking place.

The method employed for carrying this invention into effect, is described by the Patentee in the following manner:—To the saccharine matters is added from one to two thousandth parts of lime, so that in a boiler containing one thousand pounds weight of juice, about two pounds of lime should be employed; and when the juice is boiling, the scum or dirt, which rises to the surface, must be taken away, and twelve pounds of sulphurous acid in a liquid state (at four degrees of Beaume's areometer) is then to be poured in slowly, and with care; after which the juice is to be evaporated to about the thickness of twenty or twenty-two degrees, and afterwards passed through a filter, of flannel or other suitable substance, and concentrated until it arrives at the proper degree for crystallization.

In the first process of crystallization it is necessary that great care should be observed that the syrup is not too thick, because if that attention is paid to the operation, a second crystallization may be obtained, which will yield from twenty to thirty per cent. of sugar, if the first process of boiling has not been pursued too far.

The process of refining sugar of a very bad quality must be modified in a slight degree, and somewhat after the following manner:—A very strong concentrated alcohol or spirit, charged with about two per cent. of sulphurous acid, is employed, and this is to be mixed with such a suitable quantity of saccharine matter, that a small portion only of the liquid will float upon the surface. The mixture is then to be stirred several times, and after about two hours the liquid should be drawn off, and the sugar washed in pure alcohol.

The molasses is dissolved by this process, and may be drawn off by a cock, and the pure and crystallized sugar being insoluble in alcohol, will remain beautifully white and clear in the vessel. The alcohol or spirit that has been used in the before-mentioned process of washing the sugar may be distilled from the molasses, and, of course, again employed for the same purpose.—[*Inrolled in the Inrolment Office, September*, 1838.]

To William Barnett, *of Brighton, in the county of Sussex, iron-founder, for his invention of certain improvements in the manufacture of iron.*—[Sealed 10th July, 1838.]

This invention consists simply in the adaptation of carburetted hydrogen gas, and the tar produced in the manufacture of such gas, together with atmospheric air, to the manufacture of iron. The hydrogen gas may be used either separately or in combination with either the tar or a jet of atmospheric air, propelled with considerable force into the furnace by means of a force pump or other suitable apparatus.

The Patentee disclaims the use of carburetted hydrogen gas for the purpose of imparting certain qualities to the iron, and confines his claim of originality to the use of the gas, either separately or in combination with either the coal tar or atmospheric air, merely for the purpose of economising fuel; and he does not lay claim to any particular form of apparatus to be employed to carry out the invention, as it is evident that the same must be considerably varied to suit places and circumstances.—[*Inrolled in the Inrolment Office, January,* 1839.]

To WILLIAM HOLME HEGINBOTHAM, *of Stockport, in the county of Chester, gentleman, for his invention of certain improvements in the construction of gas retorts.* —[Sealed 31st January, 1838.]

THESE improvements in the construction of gas retorts consists, firstly, in the introduction of an apparatus into the body of the retort in ordinary use for the distillation of coal, for the purpose of propelling the coal through the retort, and discharging the coke from the same after carbonization. This apparatus is composed of a central shaft passing entirely through the retort, around which shaft is formed a worm or screw, for the purpose of dividing the interior of the retort into helical partitions or chambers, and thus more effectually exposing the coal under process of decomposition to the action of the heated surfaces of the retort; and, secondly, in the application of rotary motion to this helical worm or creeper, in order to cause it to propel the coal through the retort and keep it in constant motion; thus constituting a self-acting gas generator, capable of feeding and discharging itself without the necessity of removing the mouth-piece of the retort, and exposing its interior surface to the action of the atmosphere.

This peculiar combination of apparatus will be found to effect the most perfect decomposition of coal, and, at the same time, to improve the quantity and quality of gas produced, as it will be evident that the revolution of the worm shaft in the bed of the heated retort (and of an uniform heat with it) passing progressively through the coal under operation, and at the same time working or advancing it from one end of the retort to the other, will effect a most perfect and rapid distillation; while the gas evolved will become, as it were, filtered and improved, being freed from tar while effecting its passage to the exit or ascending pipe at the discharging end of the retort.

Another considerable improvement is effected by the revolution of the worm, as it will entirely prevent the interior of the casing or retort from becoming encrusted with coke or other matter to which they are usually subject, thus rendering it more durable; and it will always ensure an uniform regularity in the supply of coal simultaneously with the discharge of coke, and also that no coke will remain in the retort after it has become carbonized. I have attached to these improvements an apparatus to crush or grind the coal prior to its introduction into the improved retort, as its peculiar construction enables me to generate gas from pulverised coal, and, consequently, to produce it at a much less cost.

In order that my improvements may be more definitely explained, I have shown, in Plate XII., such representations as are necessary to illustrate their application. Fig. 9, is a side elevation of a gas retort, with my improvements attached; fig. 10, is a longitudinal section taken through the middle of the retort; fig. 11, a front elevation of the same, representing two retorts in one bench or oven.

In all these figures it will be observed that similar letters of reference are marked upon corresponding parts of the apparatus: *a, a,* is a retort of the ordinary description used for the generation of gas, which may be varied in length and diameter according to the judgment of the operator. This retort is furnished with cylindrical vessels of uniform diameter *b, b,* at each end, forming a receiving and discharging chamber; *c, c, c, c,* is the helical worm or creeper, which passes entirely through the centre of the retort, bearing in gas-tight stuffing boxes at each extremity; *d, d,* is the hopper, into the upper compartment of which small coal or cannel is placed, being sufficiently broken to pass through the grating *e, e*; this hopper is furnished with a valve or door *f,* for the purpose of dividing the body of coal, and allowing that portion which occupies the lower compartment of the hopper to be first introduced into the retort; the door *f,* may then be slidden outwards, and the coal in the upper hopper will fall into that below, and save the constant attendance of a man to charge the hopper. The small coal now falling between the crushing or grinding rollers, is completely pulverised before it enters the retort to be carbonized. To the end of the worm shaft *c, c,* there are a pair of loose and fast pulleys, around the latter of which is passed the driving strap *g,* which receives motion from ordinary line-shafting placed along the retort-house, and causes the worm or creeper *c, c,* to revolve slowly, and, consequently, to conduct the coal now under the process of carbonization gradually along the retort, and thus expose every portion of it equally to the action of heat; or it will be evident that the worm *c,* may be driven in any convenient manner. It will be seen that a constant and regular supply of coal is kept up by the crushing rollers being made to revolve by means of the toothed wheels *h*, *h*, and thus to deliver the small coal into the first coil or compartment of the worm, while the reverse end of the worm is discharging the coke, after it has been completely carbonized, from the last coil or compartment, and so on, receiving and discharging bulk for bulk at every revolution.

There is a small plate or bar *i*, *i*, cast upon the interior of the door plate of the retort at the discharge end, for the purpose of clearing the worm shaft from the coke as it revolves, and thus assisting the delivery of the coke into the discharge chamber *b*: the door or valve *k*, at the bottom of this chamber, may be slidden outwards, as desirable, and allow the coke to fall into the box or receiver *l*, *l*. This box has a loose bottom, around which is the trough *m*, *m*, which is filled with water, in order to seal the joint and prevent the escape of gas: the loose bottom is suspended upon hinges, so that it may fall and discharge the coke after the chamber *l*, *l*, has become filled. On the upper side of the discharge chamber *b*, *b*, is the exit or ascending pipe, which conducts the gas, as it is evolved, to the hydraulic main, first passing through the box or receiver *n*, *n*, to allow the deposit of such portion of tar or ammonia as may escape with it; and this deposit may be drawn off, and prevented from returning into the retort by the syphon *o*.

Having now described my invention of improvements in the construction of gas retorts, and the manner in which the same is to be performed, I wish it to be distinctly understood, in conclusion, that I do not desire to claim the exclusive use of any of the parts of which such apparatus may be composed when separately considered; neither do I intend to confine myself to any of the dimensions or peculiar forms of such apparatus as are shown in the drawings annexed, as I have therein represented such views of an apparatus constructed in the manner above proposed, as are best calculated to carry my invention into effect; but I claim the novel introduction of the worm or creeper into the body of gas retorts, and the application of such other apparatus to be used in conjunction therewith, for the purposes and in the manner above described, whether the retorts shall be of iron, fire-clay, or other material, or whether the worm or creeper shall be constructed helically, spirally, or of any other form.—[*Inrolled in the Rolls Chapel Office, July,* 1838.]

Specification drawn by Messrs. Newton and Berry.

To William Dale, *of Marsh-street, Shelton-potteries, in the county of Stafford, turner, for his invention of certain improvements in constructing columns, pillars, bed-posts, and other such like articles.*—[Sealed 14th March, 1838.]

This invention of certain improvements in constructing columns, pillars, bed-posts, and other such like articles, consists in forming each of such columns, pillars, bed-posts, and other like articles, (as pilasters, shafts, curtain or cornice poles,) of several ornamental pieces or component parts of china or earthenware, joined or combined together by means of a rod, tube, or shaft, passed through the interior of such several pieces, for the purpose of holding them securely and firmly in combination, and thereby rendering them, when so combined, strong and fit for the various purposes to which such ornamental articles of furniture or decoration may be applicable.

Figs. 1, 2, 3, 4, 5, 6, 7, and 8, in Plate XII., represent the manner of constructing my improved columns, pillars, bed-posts, and other such like articles: fig. 1, is an external elevation of a bed-post complete; fig. 2, is a vertical section of the same, the several component tubular pieces of china or earthenware being securely held together by a central shaft of metal, or of any other suitable material; fig. 3, shows all the component tubular pieces of china separated from each other; and fig. 4, exhibits the same in vertical section.

The several tubular pieces, *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, made of earthen or china ware, may be of any desired ornamental shape or form externally, provided that their ends fit accurately one to the other at their functions. These parts, or tubular pieces, are made or manufactured according to the ordinary process of making earthen or china ware articles, and are coloured, gilded, or otherwise ornamented, according to the taste or design of the artist, and are baked, burned, or glazed in the usual way.

The several tubular parts or pieces, *a*, *b*, *c*, &c., are to be either formed with ends which will socket into each other at the junctions, as shown in the drawings, or they may be made with flat ends meeting together, in which last case the joint should be covered by an ornamental hoop, ring, or circumscribing piece, the object being to hide the junctions of the two pieces. The whole of these tubular pieces of china are held together by the rod or shaft *k*, which is passed through the several pieces *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, and at the outer ends screw nuts or collars *i*, *i*, or other fastenings, are in the most convenient way adapted to the rod or shaft, for the purpose of confining the whole of the pieces, and holding them securely together.

It may be desirable here to observe, that I recommend applying a slight collar or packing of wash leather, woven cloth, or some other soft material between the ends of the tubular pieces of earthen or china ware, for the purpose of obtaining soft bearings at the joints of the brittle china tubes, in order that I may be enabled to tighten or screw up the end nuts upon the central shaft without danger.

The lower end of the metal shaft or rod *k*, may be formed to receive the castor usually applied to bed-posts; and the upper end or top part may be made to receive the bed cornice and a cap piece, or other ornamental appendage, which will be readily understood by any practical workman, and, therefore, need not be further described.

Fig. 5, represents a cornice pole or curtain pole, constructed according to my improvements; and fig. 6, is a section taken longitudinally through the same, letters of reference being marked upon corresponding parts, showing the combination of the china tubes *a*, *b*, *c*, &c., and a metal or other suitable shaft *k*, as in the former figures; it will not, therefore, be necessary for me to repeat them, only remarking that the end pieces and the fastening nuts, in this instance, are covered by caps or pieces *l*, *l*, which hide the ends of the shaft, and form ornamental bosses on the ends of the curtain pole or cornice.

Fig. 7, is a side elevation; and fig. 8, a vertical section of an ornamental pillar or column, with branching scroll-work, intended to support a sideboard, or to be used for any other purpose for which the same may be applicable. These figures exhibit my invention as further carried into effect, or in which several pieces of china are connected together, and made fast by a metal or other suitable shaft and screw nuts, as before described.

Having now explained the nature of my invention, and the manner of carrying the same into effect, I would remark that I am aware that two or more pieces of ornamental vases and such like articles have been joined together by iron pins and screw nuts, but the same forms no part of my invention or improvement, and therefore is not intended to be claimed by me. But that which I do claim as my invention, is the constructing of columns, pillars, shafts, pilasters, bed-posts, curtain poles, or cornish poles, and such like articles of several pieces of earthen or china ware, united, strengthened, and supported by an internal shaft or rod passing through the whole length of the same, and furnished with screw nuts or other description of fastenings and collars, &c., as hereinbefore set forth and described.—[*Inrolled in the Rolls Chapel Office, September*, 1838.]

Specification drawn by Messrs. Newton and Berry.

To JOSHUA PROCTER WESTHEAD, *of Manchester, in the county of Lancaster, small-ware manufacturer, for his invention of an improved method of cutting caoutchouc or India rubber, leather, hides, and similar substances, so as to render them applicable to various useful purposes.*—[Sealed 16th February, 1836.]

THIS invention is described by the Patentee in the following manner; and the drawings annexed to the specification represent one arrangement only of machinery or apparatus by which the improved method of cutting is carried into effect.

Fig. 11, Plate XIII., represents an end, and fig. 12, a front view of a machine, in which A, is a driving shaft, which receives motion by hand from the crank handle A 1, or from other power, as circumstances may require. This motion can either be imparted or arrested at the pleasure of the operative or person attending the machine; B, represents the fly wheel, for the purpose of equalising the rotation of the shaft A; C, is a pulley, keyed on the shaft, and carrying the strap D. Immediately above the pulley C, and parallel to the shaft A, is placed the shaft E, supported by two hangers *d, d,* and revolving freely on its axis.

On this shaft are placed the pulleys *e,* and *e* 1; the former receiving motion from the strap D, and the latter imparting motion to the strap F, which passes round the pulley *f,* placed firmly on the small shaft f, f, carrying the two small circular *disks* or cutters *g, g,* which are revolved (in the direction of the arrows) at an increased velocity due to the relative circumferences of the various pulleys C, *e, e* 1, and f. By reference to the driving shaft A, at the opposite extremity to that at which the power is imparted, it will be seen that a small bevil wheel a, is placed thereon, gearing into a similar bevil a 1, or a 2, placed on a transverse shaft *b, b,* as best seen at fig. 11. This shaft *b, b,* is allowed to move endwise in the journals or supports in which it is supported, so that either the bevil a 1, or a 2, can be put in gear with the driving bevil a, and thereby the direction of rotation of the shaft *b, b,* may be reversed at pleasure. When either of the bevils a 1, or a 2, are put in gear with the bevil a, it is kept so by means of a small catch *b* 1, which falls into a groove cut into the shaft *b, b,* and prevents any ends, traverse, or movement of the shaft until removed by the operator for the purpose of reversing the rotation. From the shaft *b, b,* motion is conveyed by means of the pulley G, and the strap G 1, to the pulley H, which is supported on a shaft, by hangers *h, h,* similar to the shaft E, already described. This shaft is also provided with a small drum or barrel I, as seen at fig. 12, which imparts motion, at a reduced speed, to the strap *i,* and thence to the pulley K, placed at one end of the shaft *m, m, m,* as seen at fig. 12. At the opposite end of the shaft *m, m,* (which is supported in the sliding carriage *n, n, n, n,*) is placed a spur wheel, gearing into a similar wheel placed on the extremity of a screw, passing the whole length beneath the carriage *n, n, n, n,* and taking into a stationary cut attached to the part *n* 1, *n* 1, similar to the arrangement for traversing the slide rest, in lathes for the ordinary construction, the direction of traverse or end motion of the carriage *n, n, n, n,* necessarily depending on the direction of rotation of the pulley K: *o, o,* are two supports attached to the carriage *n, n, n, n,* and provided with small shafts *r,* and *r* 1, which receive a slow revolving motion from the bevils o 1, and o 2, the former of which is placed on the shafts *m, m*: P, P, represent two stationary shields or rests supported from the part *n* 1, *n* 1, each provided with an horizontal slot or opening, to allow of the alternate traverse of the small shafts *r,* and *r* 1, as well as a perpendicular cut or opening, through which the lower extremity of the cutter *g,* is caused to revolve, as seen at fig. 12.

By tracing the motion of this machine, it will be seen that the cutters *g, g,* are receiving a quick rotation at the same time that the shafts *r,* and *r* 1, are receiving a slow rotation, as well as a slow end traverse or progressive motion dependent upon the screw motion, which governs the traverse of the carriage *n, n, n, n*: supposing, therefore, a flat disk or piece of caoutchouc, leather, hide, or other similar substance to be secured in the position represented at *s*, by means of washers and screw nuts, or other convenient apparatus, it will partake of the motion of the shaft *r,* on which it is placed, and gradually revolve and keep in contact with the cutter *g,* regularly approaching the same by the traverse of the carriage *n, n, n, n,* in the direction of the arrow *n* 6, and thereby cut the material *s,* into fillet or tape *t, t, t,* till the whole is disposed of. The utility of the rests or shield *p, p,* will now be obvious in supporting the material to be cut when subjected to the action of the cutter *g,* which has a constant tendency to press it against the surface of the rest *p.*

In operating with this machine, it will be remarked that while the shaft *r*, which carries the material *s*, is approaching the cutter *g*, the corresponding shaft *r* 1, is receding from the cutter to which it belongs, so that when the piece *s*, is finished, and the shaft *r*, which supported it is near to the cutter *g*, the corresponding shaft *r* 1, is at the greatest distance from its cutter. In this position the machine is stopped by the operative or attendant, and the disk or flat piece of caoutchouc or other material placed on the shaft *r* 1, the catch *b* 1, elevated, and the shaft *b*, *b*, removed endwise, in the direction of the arrow *b* 6, fig. 1, so as to relieve the bevil a 1, and bring the bevil a 2, into gear with the driving bevil a, and thereby reverse the direction of the rotation of the pulley K, and, consequently, the traverse of the carriage *n*, *n*, *n*, *n*. The machine being again put in motion, the cutting proceeds on the one shaft *r* 1, while the opposite shaft *r*, recedes from the cutter *g*, preparatory to receiving a fresh piece of material as soon as that under operation shall be finished, and the machine again stopped as before; thus the shafts *r*, and *r* 1, are alternately loaded, and the material cut, from a flat disk, into a continuous fillet or ribbon.

Now, although the machine which I have above described answers the intended purpose of enabling me to carry into effect my improved method of cutting caoutchouc or India rubber, leather, hides, and similar substances, so as to render them applicable to various useful purposes, I am fully aware that the same may be variously modified; as for instance, instead of imparting a rectilinear or progressive movement, as well as a rotary motion, to a piece of caoutchouc or India rubber, leather, hide, or similar substance intended to be cut into fillets, a revolving motion only may be imparted; and by causing the pedestal or bands upon which the revolving cutters work, to be fixed on or attached to a sliding carriage, and made to advance in the direction of the material to be operated upon, a similar effect may be produced, and the caoutchouc, leather, hide, or other similar substance be cut into fillets or tapes of the required thickness.

It is also obvious, that instead of using revolving circular cutters, longitudinal or straight knives or cutters may be applied, to which a rapid reciprocating motion may be given, for the purpose of cutting the caoutchouc, hides, and similar substances into fillets.

The position of the various motions and parts of the machinery for the accomplishment of my method of cutting such materials, may also be considerably varied if required, and rendered more completely self-acting or independent of the operative or attendant. But as one great advantage arising from the adoption of my improved method is, that of cutting pieces of material of irregular shape and size, the adjustment of which must always depend on the judgment of the operative, I have considered it best to leave the machine also greatly dependent on his or their attention.

I therefore wish it to be understood that I claim, as my invention, not only the machine hereinbefore described, but also any modification of such machine, by which my improved method of cutting caoutchouc or India rubber, hides, and similar substances into a band, tape, or fillet, by means of a revolving or other cutter acting on the exterior edge of such materials, and regularly cutting the same in a spiral or helical direction towards the centre, can or may be effected; and such my invention being new, and never before effected by machinery, I do hereby declare this to be my true and faithful specification of the same.—[*Inrolled in the Inrolment Office, August,* 1836.]

To Miles Berry, *of the Office for Patents,* 66, *Chancery-lane, in the county of Middlesex, patent-agent and mechanical draftsman, for certain improvements in the means of economizing heat and fuel in furnaces or closed fire-places, being a communication.*—[Sealed 31st May, 1838.]

These improvements in the means of economizing heat and fuel in furnaces or closed fire-places, consist in a mode of collecting the smoke, gas, and other vapours emitted from the combustion of fuel and from the smelting of ores, and conducting such vapours into a furnace, for the purpose of aiding the combustion in conjunction with or in addition to the ordinary blast of atmospheric air.

The manner in which the inventor has carried this object into effective operation will be seen by reference to Plate XIII., in which fig. 1, exhibits a series of apparatus shown in section: a, a, represents a blast furnace, containing ore and fuel as usually combined when the ore is submitted to the process of smelting; b, is the hopper at top, by which the ore and fuel is introduced into the tower of the blast furnace, at the lower part of which hopper a sliding plate or shutter c, is adapted and fitted tightly, so that, when closed, no gas or vapour can escape through the top of the tower and hopper. At the bottom of the tower the ordinary air pumps d, d, are shown, by which the blasts from blowing machines are conducted through the tuyere holes or blower apertures into the furnace, for the purpose of carrying on the combustion.

Near the top of the tower a long elliptical opening is made through the brickwork, which communicates with a pipe e, for the purpose of conducting away the smoke, gas, and other vapours emitted from the combustion of the fuel and smelting of the ore when the sliding plate c, is closed. This pipe E, rises at an inclination of about forty-five degrees, in order that it may not be choked by the materials, and that the dust carried up by the current may be made to fall back into the furnace. This inclination of the pipe is not, however, absolutely essential, as the quantity of dust will be small, and as the tower will not be filled with the material quite up to its top: care, however, must be taken to keep the aperture clear, and the internal capacity of the pipe E, must be considerable, so that the vapours may pass through freely.

As, during the occasional re-charging of the smelting furnace with ore and fuel, the slider C, must be opened, the passage of the vapours through the pipe E, would be partially interrupted, another channel is therefore provided, by which the vapour would be carried into the pipe E. For this purpose, in the brickwork of the tower, an annular recess F, F, is formed, at least a foot below the top of the materials under operation, and an elevated branch pipe G, led therefrom into the pipe E, which at that time should be closed above by a sliding plate Z.

Having now described the means by which the smoke, gas, and other vapours are arrested in the upper part of the tower of a smelting furnace, and conducted from thence by a pipe, I now proceed to show the manner in which such smoke, gas, or vapours are applied to the purpose of affording heat, and thereby economizing fuel in assisting the operation of another furnace employed in the process of melting metal for a foundry.

The pipe E, may be carried down in any form for conducting the gas and vapour, but, in order to divest the gas and vapour of dust, it is desirable to insert the lower end of the pipe E, in a vessel of water. This vessel is shown at H, H, about half filled, and an inverted vessel I, is placed within it in the way of a gasometer, but held firmly in its place by bolts and nuts. The pipe E, passes through the top of this vessel I, and its lower end is carried below the surface of the water, so that the gas and vapour must rise up through the water into the upper part of the vessel I, leaving the dust behind it, the water being supplied and kept at its proper level in the vessel H.

In the upper part of the vessel I, a pipe K, is inserted, which conducts the gas and vapour onward, and this pipe passes in a contorted form through a reservoir of water L, L, by which means the gas and vapour become cooled, and the steam contained in the vapour condensed, which condensation may be allowed to escape by a syphon or by a cock.

From the reservoir L, the pipe K, proceeds to an air-pump M, into which the gas is delivered by two inlets, each being furnished with a clack valve opening inwards. In the pump M, a piston N, is made to work by any suitable means, for the purpose of drawing the gas through the pipes E, and K, above described, and also for forcing the gas onward through the pipes O, O, O; which pipes are furnished with clack valves, opening outwards.

The gas, in its progress through the pipes O, towards the jets P, P, in the tuyere holes of the melting furnace Q, is allowed to pass by a branch pipe R, into a vessel like a gasometer S. This gasometer S, acts as an air vessel, regulating the pressure of the current of gas; for when the elastic force of the current of gas at the jets is greater than required, its pressure causes it to recoil upon the water in the vessel S. This apparatus, however, is well known, being the same as is usually employed in iron-works for regulating the air which feeds the combustion of blast furnaces.

In order to combine the currents of gas thus forced into the furnace with the currents of atmospheric air, commonly employed for supporting the combustion, another jet T, is inserted into each of the jets P, P, the jet T, conducting the atmospheric air from the pipe U, into which it is forced by the ordinary blowing apparatus.

It will now be perceived that the two currents of gas and air will become united in the ends of the jets P, P, and that the gas and air in combination, being in this way forced into the furnace, the combustion will be greatly promoted, and the heat act more forcibly upon the metal intended to be melted, thereby economizing heat and fuel.

I would here remark, that though the nozles of the air pipes T, should be placed concentrically within the nozles of the gas pipes P, it is desirable that their jets should not be coincident, but that the jet of the air pipe be about six inches behind that of the gas, in order that the air and the gas may be properly mixed together before entering the furnace; and it is desirable that the force with which the air is impelled should be greater than that of the gas. In some cases I find it desirable to blow into the furnace through the upper tuyere holes, and, for this purpose, make the pipes capable of elongating, by forming parts of them as sliding tubes. In applying this invention to refining furnaces, it will be proper that the jets of the gas tubes should be larger than those of the air tubes, as a greater quantity of gas should be introduced to promote the object with the best effect

For a reverberatory or puddling furnace, experience has proved that the temperature will be greatly increased if the gas and air be brought into combination and mixed within the furnace. For this purpose the inventor suggests that the air and gas be severally introduced at different tuyere holes, as shown in the sectional elevation fig. 2, and plan or horizontal section fig. 3, in which P, is the gas pipe, and T, the air pipe. If the two aeriformed fluids, by the means before described, be thus introduced, they will become perfectly combined at the part required; and being then ignited by the introduction of a flame, or by a small quantity of burning coals, exert the most beneficial effects upon the metal under operation. And if an extra fire be required, fuel may be placed between the two bridges at *z*.

In such constructions of furnaces as carry on the combustion principally by the draft of a chimney, jets of gas, obtained as before described, may be applied in the manner represented in the sectional elevation, fig. 4, and in the horizontal section, fig. 5. The gas is to be introduced by the pipe P, into the front part of the furnace, and the atmospheric air is allowed to pass by ordinary draught through the register of the ash pit, and at such other parts as may be required; and the combined aeriformed fluids being ignited by a small quantity of burning fuel on the grate Y, the heating effect will be obtained. One, two, or more series of pipes, or a broad flattened pipe, may issue from the main gas pipe P, for distributing the gas equally in the front chamber of the furnace. If the furnace under the boiler be required to burn constantly, and the supply of gas from the blast furnace be occasionally suspended, it may be desirable to introduce an additional fire between the two bridges at *z*.

If the iron is required to be heated in a reverberatory furnace without being brought to a welding heat, gas and atmospheric air combined and ignited may be employed without any other fuel. For this purpose gas and air may be introduced, as shown in the sectional elevation, fig. 6, and horizontal section, fig. 7: P, is the pipe for bringing the gas from the smelting furnace, which pipe may be spread out into the form of a flat tube opening into the mouth of the furnace; in the chamber of the mouth of the furnace, a series of flat tubes *a*, *a*, *a*, are placed perpendicularly, open at bottom to the ash pit, and at top to the furnace. The gas passes from the pipe P, into the front chamber, and thence rises up between the air tubes *a, a, a,* into the furnace, and the atmospheric air from the ash pit at the same time rising through the tubes *a, a, a,* becomes mixed with the gas, which, when so combined, is to be ignited by the introduction of a flame, as before said. If an additional quantity of atmospheric air should be required, it may be introduced through an opening above.

In such construction of furnaces as require a constant supply of fuel to be kept in a state of ignition, the gas may be employed as an auxiliary to assist combustion, and thereby to economize fuel.

The manner in which the present improvement may be adapted to such a case, is represented in the sectional elevation, fig. 8, and horizontal section, fig. 9. The gas is, in this instance, brought under the grate by the pipe P, and distributed, by several branch pipes, over the upper part of the ash pit, whence it rises by the ordinary draft of atmospheric air through the grate into the furnace. The quantity of gas thus delivered must be regulated, otherwise the quantity might impede the passage of atmospheric air required to keep up the combustion. If it should be preferred to introduce the gas above the grate, that may be done by means of the upper pipe P*, instead of the lower pipe P; and in that case, atmospheric air must be introduced by openings immediately contiguous to the nozle of the pipe P*.

In some cases it may be desirable to effect a mixture of the air and gas in a vessel previously to its being introduced into a furnace; for this purpose the box shown at fig. 10, may be employed. Into the back of this box the end of the gas pipe P, is inserted, and below it a similar pipe T, for conducting the atmospheric air. The box is divided by two or more partitions, each of which is perforated with a multitude of small holes; the gas and air in passing through these holes necessarily becomes intermixed, and it ultimately proceeds through the jet to the furnace. It is, however, desirable that a wire-gauze guard should be stretched across the jet, in order to prevent the lighted gas from re-passing into the box, and there exploding.

If, in the process of smelting, it be not thought necessary that the gas to be employed should be impelled with great force, and freed from dust and steam, it may be made to come directly by the pipe E, fig. 1, into the fire-place, without making use of the vessel of water H, of the reservoir L, L, the air pump M, and the vessel (similar to a gasometer) S. It is sometimes desirable to heat the air and gases in any well-known apparatus before employing them in furnaces.

Lastly, I desire it to be understood that I do not intend to confine myself precisely to the forms and arrangements shown in the drawing, but that I claim any and every convenient mode of collecting the gas and inflammable vapours emitted from a smetling furnace, and of conducting and applying such gas and inflammable vapours into a fire-place or furnace, for the purpose of heating by its combustion, or assisting the combustion of the other fuel which may be employed with it, in producing heat for any purpose to which such heat may be applicable.—[*Inrolled in the Rolls Chapel Office, November,* 1838.]

Specification drawn by Messrs. Newton and Berry.

To Joseph Needham Taylor, *of Red Lion-square, in the parish of St. George, Bloomsbury, in the county of Middlesex, a captain in the Royal Navy, for his invention of a certain method or certain methods of abating or lessening the mischiefs arising from the shock or force of the waves of the ocean, lakes, or rivers, and of reducing them to the comparatively harmless state known by the term broken water, and thereby preventing the injury done to, and increasing the durability of breakwaters, moleheads, piers, fortifications, lighthouses, docks, wharfs, landing places, embankments, bridges, or pontoon bridges; and also of adding to the security and defence of harbours, roadsteads, anchorages, and other places exposed to the violent action of the waves.*—[Sealed 4th July, 1838.]

The subject of this patent is the construction of a floating pier or breakwater, which will have the effect of breaking the force of the waves, and, at the same time, not offer such a dead resistance as a solid pier or breakwater would, if constructed of masonry.

The inventor conceives that if he constructs a floating body as a breakwater, which will break the force, and, at the same time, yield to the impetuosity of the waves, that little or no damage will be sustained by such *yielding* breakwater in case of a violent storm, when a pier, breakwater, or other similar stationary work, constructed of solid masonry, and in the ordinary manner, would be materially injured, or, perhaps, entirely destroyed.

The breakwater invented by the Patentee, is constructed of very strong timbers firmly bolted together, and forming a sort of framework: the interstices between the frame timbers is partially filled up with very strong planks; these planks, however, must not be placed too close together, as room must be left between them to allow the water to flow through, otherwise the waves would force up some of them. This floating or yielding breakwater, constructed in the aforesaid manner, is then to be firmly anchored by chain or other cable, in any situation in which it may be required; and it will be found that as the breakwater or other work floats on the surface of the water, and slightly yields to the waves, and thus decreases their force, no serious consequences need be apprehended.

The Patentee concludes his specification by saying, that he claims as his invention the construction of a *yielding* pier or breakwater, which will effectually break the force of the water, and, at the same time, yield to it, so that the violence of the waves will be less likely to take any disastrous effect upon it.—[*Inrolled in the Rolls Chapel Office, January,* 1839.]

ORIGINAL COMMUNICATION.

(To the Editor of the London Journal of Arts.)

Sir,—As an inquiry into the nature and properties of fuel is one of great public interest, both as regards its value in the generation of steam, and in connexion with the arts and manufactures of this country, I make no apology for communicating the following facts and observations through your valuable Journal.

Being, through the Dublin Steam Company, extensively connected with steam navigation, and having been instrumental in introducing it into Ireland, in aid of inland intercourse on the River Shannon, my attention was drawn, several years back, to the substituting turf, for coal, as a fuel for the steam-vessels, on the score of economy and convenience—coal being obtained with difficulty, and at a great expense; while turf abounded in numerous districts along the hundred miles of that river, over which the steam-vessels daily passed. A further inducement was, that its adoption as a fuel for steamers would form a valuable and profitable source of employment. The result of the trial has been satisfactory in every point of view.

In the adoption of a turf fuel, no small inconvenience, however, was experienced from its great bulk; and, in wet seasons, from its retaining so much moisture as seriously to detract from its heating powers. My attention has long been directed to the remedying these two evils, by obtaining a more condensed and a drier fuel.

During my investigation I was struck with the meagre accounts which books afforded of this valuable natural product, and the little attention which had been given to it by the scientific and practical men in this country, while, on the continent, there had been many experiments and much valuable inquiry both as to its properties and varieties. As to the means of increasing its density, and thus remedying the evil of its excessive bulk, nothing had been attempted, neither had any effort been made at improving the mode of preparing it for fuel; yet these are objects of great importance. My attention was further drawn to the value of turf, or peat fuel, as it is called in England and Scotland, by the statement, that it had not only the power of giving an intense heat, and with great rapidity; but that it possessed properties which gave it great value when applied to the various processes of metallurgy, and particularly in the working of iron when the fuel comes in contact with the metal. This led me to pursue the inquiry on another ground, namely, as being likely to supply an improved fuel for the uses of the furnace and the forge.

The well-known superiority and high-money value of "charcoal iron," (iron manufactured by means of the heat from charcoal, and which is the leading peculiarity of Swedish iron,) gave a further stimulus to the inquiry. Coke prepared from turf, as being a pure vegetable charcoal, ought, it would appear, not only to possess heating properties analogous to those from wood charcoal, but to be equally free from those deleterious ingredients which abound in mineral coal. Such, indeed, is the value and purity of the iron manufactured by the aid of wood charcoal, preference to coal coke, as adopted in Great Britain, that we find an extensive company now formed in the metropolis, called the "India Steel Company," established for the purpose of importing iron manufactured by themselves in India by the means of charcoal, in procuring which they have there great facilities, and converting it into steel by the same material in this country. It is to be hoped that by such means the importation of Swedish iron may ere long be rendered unnecessary.

Of the use of turf coke in the working iron, many strong testimonials from practical men were given in a tract presented to me by Lord Downshire, whose attention had long been directed to the means of rendering the Irish bogs more valuable. Its importance for the uses of the forge cannot be overlooked. Much injury is sustained, not more from the use of inferior iron, than from the impurities of the coal and coke with which, in many parts of England, we are compelled to work it. The extent of this evil and its consequences, cannot, it is true, be stated in figures, but it is not less appreciable on that account. This is well known by all workers in iron and steel; and when we find an important part of our machinery break, and probably do great mischief, we are apt to censure the workman, when we should rather lay the fault on the iron, or the impure fuel with which he had to work.

In pursuing the inquiry as to the manufacture of turf coke, I fell naturally into the common error of taking the lower portions of the bog in preference to those nearer the surface; and from this circumstance, that the latter, on account of their lightness, appeared wholly unsuited to the purpose; while the former, from their greater comparative density, seemed alone available in producing a coke which could stand the blast. From the lower strata a sufficiently dense coke could be formed, by the aid of suitable coking stoves; but it was found to be so impure, and impregnated with so large a proportion of incombustible and deleterious matter as to have an injurious effect on iron, from an acid which it was supposed to contain. From the upper strata, and particularly where they were composed of bog moss, which had made but little progress towards decomposition and solidification, I obtain an exceedingly pure carbon, giving a very small per centage of useless, and no injurious, matter. This upper portion of the bog, however, was of so light and porous a texture, and so apt to re-absorb moisture, by which its heating properties were much reduced, that it would scarcely repay the labour of cutting and saving, even for domestic fuel, while the lower strata, on the contrary, often approached the solidity of coal. This superior density had been acquired in some degree by the decomposition and consequent solidification of its vegetable fibre, but still more by the consolidation, through ages, from the pressure of the superincumbent mass, often to the depth of twenty or thirty feet. But this great density, valuable as it may be, had been obtained at the expense of its purity and heating properties, by the addition of many heterogeneous and incombustible substances; and which, *pro tanto*, and without reference to their chemical effects, deteriorate its calorific power and usefulness as a fuel.

Without going further into this inquiry, it is enough for our present purpose that we do find this difference existing between the upper and lower divisions of all bogs. This is well illustrated by Mr. Griffith, in his analysis of a part of the bog of Allen, of the depth of thirty-eight and a half feet, as given in the bog reports. On examining his report, the upper portions, even to the depth of eight or ten feet, was stated as exhibiting so "open-grained and fibrous a texture," that the different species of the mosses of which it had been composed were easily discernible; the *sphagnum palustre* (the lightest of the bog mosses) predominating. This portion of the bog was of so low a specific gravity as 356 (water being taken at 1000); and what is here important, yielding not more than one per cent. of incombustible ash. As he descended to the lower portions, he found the mass progressively increasing in density, until it showed a "fracture conchoidal, lustre shining, with a strong resemblance to coal, and susceptible of a high polish;" and further, that it was capable of yielding a "very compact charcoal with internal lustre shining." He found its specific gravity increased from 356 up to 1236, but accompanied with the drawback, that its incombustible ash had also increased from one to twenty per cent., independently of the injurious tendency of those substances with which it had become combined; thus proving that as the bog gained in density, it lost in combustible value, weight for weight, and that even as a domestic fuel it was but seldom used, " owing to the unpleasant smell it gave out when ignited."

I may here observe, that I have burned the compressed peat coke, which forms the subject of the following analysis, in a small room, in a stove resembling Joyce's stove, standing on the table, for four days and nights successively, during which it was never extinguished, and without any perceptible unpleasant smell or other annoyance.

Now, having thus ascertained that the upper and lighter portions of the bog had the greatest purity and heating power, weight for weight, the difficulty presented itself of combining density with purity, and which in the natural state do not co-exist.

In this I have completely succeeded, having obtained a coke, from the lighter portions of the bog, possessing not only double the density of wood charcoal, and equal to that of coal coke, but possessing that purity which is so essential in the working of iron. To ascertain the relative values of the compressed peat, and peat coke, as compared with coal, coal coke, and charcoal, I had a very accurate analysis made by that able eexperimentr, Mr. Everitt, and whose report I here subjoin:—

REPORT OF EXPERIMENTS ON PRESSED PEAT, AND ON COKE MADE THEREFROM.

DENSITY.—The density or specific gravity of water	1000
Compressed peat, the thinnest and hardest pressed..	1160
Ditto, the thicker or less pressed	910
Peat coke, the thinnest or hard pressed	1040
Ditto, the thicker or less pressed	913
The resin fuel	1140
The resin alone	1110
The hardest and dry woods, such as oak, ash, elm, vary from............................	800 to 885

And the lighter woods, such as poplar, pine, &c., from	383 —	530
Charcoal from hard woods, varies from.....	400 —	625
Coals vary from	1160 —	1600

Hence we see that the hardest compressed peat is denser than the hardest woods, in the relation of 1160 to 885; and compared with some of the lighter woods, nearly double. Further, that the coke prepared from the hardest compressed peat is nearly double the density of ordinary charcoal. In common practice, it is reckoned that 100 lbs. of charcoal occupy the same space in a measure as 200 lbs. of coke. The peat coke would, weight for weight, occupy the same, very nearly, as common coke.

Calorific Power.—The next point of investigation was the calorific power, as compared to coal, common coke, and charcoal.

The usual method of making assays of this kind, is to burn weighed quantities of the respective fuels, and endeavour to ascertain how much water each respectively will raise a given number of degrees, or convert into vapour. But experiments of this sort, unless made on a very large scale, cannot lead to any comparable results. It is given in Berthier (Essais par la voie seche, vol. i. p. 289), as being the result of accurate experiments, that a given weight of charcoal will raise 78 times its own weight of water from 32° to 212°, or boil off in vapour $11\frac{8}{10}$ its weight: which data do not differ materially from the results obtained on a large scale, by J. Parkes (see his paper in the "Transactions of Civil Engineers," vol. ii. p. 161). Now we know, from actual trial, that weighed portions of coke, charcoal, &c., used under stills and boilers, holding only from 5 to 10 gallons of water, will not produce $\frac{1}{10}$ of this effect. I am here convinced of the utter futility of trusting to any such experiments on a small scale, with the view of having any thing like an approximation to the true relative values of fuel; even in the best constructed calorimeters, where only a pound or so of the fuel is consumed, it is very difficult to command uniformity through any two experiments. I was here induced to adopt the method recommended by Berthier, in his work, vol. i. p. 228, in order to obtain the relative values of these fuels.

It is assumed, from the results of almost all experiments, that the absolute quantity of heat generated, during the combustion of any fuel, is in exact relation to the quantity of oxygen consumed on entering into combination: hence, in order to ascertain the relative calorific powers of fuels, it is only necessary to ascertain the quantity of oxygen each consumes in burning.

The best mode of doing this, is to mix a weighed quantity of the fuel with a slight excess of litharge (oxide of lead), and find what quantity of metallic lead is reduced. It is to be remarked, that this method cannot be applied to such fuels as contain any volatile matter, from Berthier (and which also agreed with some trials made by me on the same substances).

10 parts of pure carbon, will give of lead . .	340 grs.
10 parts of good wood charcoal, from	300 to 323
10 parts of dry woods, from	120 — 140
10 parts of good coke, from	260 — 285

It may be here remarked, that assuming the principle, which is the foundation of this mode of assaying, to be correct in practice, it is susceptible of great accuracy; for, as every *single grain* of carbon produces 34 grs. of lead, any error in estimating the lead is reduced to $\frac{1}{34}$th in estimating the carbon.

The following results are averages of two, and sometimes three experiments on the same fuel; and in many cases the metallic lead in two consecutive trials did not differ more than 2 grs., which corresponds to only $\frac{1}{17}$th of a grain of pure carbon.

10 parts of the peat coke—this was picked surface peat—gave	277
10 parts of peat coke, lower strata	250
10 parts of the pressed peat.	137

The resin fuel, containing so much volatile matter, could not be tried in this way; and its calorific value could not be ascertained from the difficulty of arriving at any satisfactory result, except on a large scale.

The above numbers represent the relative quantities of heat which can be produced by the same quantities of each of the fuels; and in cases where quantity of heat alone is the consideration, these numbers will also represent their relative values.

But intensity of heat is often of more consequence than quantity; and intensity depends very much on the density of the fuel, Thus, charcoal can never produce so high a heat as coke; and, in this respect, the denser peat coke and common coke are about equal. These comparisons are quite irrespective of any foreign matter being present which may be injurious to the quality of iron, where the fuel is used for reducing the metal from its ore, or for working iron by fire generally, or when it is used under iron boilers for generating steam.

To see how far it was probable or not that the peat coke contained matter likely to act injuriously in this respect, like some coke, portions were burnt in a variety of ways, when no sulphurous acid smell could, in any case, be perceived; sulphur, or metallic sulphurets, are the usual ingredients in common coke, to which their corrosive effects on iron boilers is to be attributed; and such coke, during burning, always give very perceptible quantities of sulphurous acid gas.

As the nature and quantity of ash is sometimes of importance, I have also investigated these points with great care.

An average of two experiments, where 1000 grains of peat coke (made from the surface peat) were burnt, till all carbonaceous matter was consumed, gave $\frac{5}{100}$ for the quantity of ash of a light buff colour.

100 grains of such ash contain common salt ..	3. 5
Silica—sand and silica combined............	15. 0
Sulphate of lime	22. 5
Carbonate of lime	43.25
Magnesia, and carbonate of magnesia	15.00
Alumina	0.75
	100.00

The ash contained no carbonate of potassa, and is remarkable for the large quantity of magnesia present.

From my trials I am of opinion,—1st, That the peat coke examined by me contains nothing which would, during the burning, be more injurious to iron, than wood charcoal, or the best coke—whether it be used to work iron, or under boilers for the generation of steam.

2d. That it is equal to the best coke, weight for weight; in heating power, a little inferior, weight for weight, to wood charcoal, where quantity of heat is the only consideration; but where bulk of stowage and high intensity of heat are important considerations, it is superior to wood charcoal.

London, Jan. 18th, 1839. THOMAS EVERITT,
6, Torrington-square;
or, Laboratory Medical School,
Middlesex Hospital.

The above analysis was made on turf from Lancashire; but, from other experiments, I find the turf from many of the bogs in Ireland exceeding it in purity, and containing a much smaller proportion of incombustible matter.

In considering the foregoing report and analysis, the great density of both the peat and peat coke, though produced from the lighter portion of the surface turf, is remarkable, the compressed peat being thirty per cent. denser than oak wood, and double that of the lighter woods, while the coke is double the density of charcoal, and on a par with coal coke.

I may here add, that this density which is so valuable where intensity of heat is an object, may be still further increased, and with little additional expense.

This being the first time that the results of the litharge test, as applied to turf coke, has been communicated in this country, the value of which Berthier, in his elaborate and admirable essay on combustible bodies, has fully established, I may be permitted to say that its accuracy, and the small amount of practical error to which the process is liable, as shown by Mr. Everitt, gives it a high claim to our attention, although to persons not familiar with the nature of chemical tests, it may not be so self-evident. We here see that the extraordinary attraction which carbon has for oxygen, and the power which it thereby exercises of de-oxidizing metallic oxides, renders the litharge test the most suitable for determining the absolute purity and calorific powers of the various cokes at least on a small scale. The carbon, under a high temperature, uniting with the oxygen in porportion to its calorific powers; while the lead, being thus deprived of that which is essential to its state of oxide, is precipitated in its pure metallic form, the relative weights so thrown down representing the true combustible values of the several cokes.

It will be observed that Mr. Everitt, in stating the quantity and intensity of the heat given out by peat coke, adds, that these are irrespective of the presence of any foreign matter which may, be injurious to the iron. Now, we know that many foreign substances do enter into the composition of coal and coke, and do exercise a very injurious influence over iron and steel in the furnace and forge. In this respect the importance of the peat coke becomes apparent; iron is not only sooner brought by it to a welding heat, but it is found to work softer, and with less of that scaling which is so injurious, particularly in the operation of welding.

These facts I have proved both in the furnace where large boiler plates are heated, and in the operations of the forge where even the worst iron was improved in quality.

It is not an unimportant consideration that peat coke may thus be produced from that portion of the bog which has ever been rejected as a domestic fuel, when a denser kind is to be obtained. Again, that it is precisely that description of turf which most abounds in Ireland, and in most of the large bog districts has hitherto been regarded as an absolute incumbrance; alike unfit for fuel and for conversion to agricultural purposes. This arises from its extreme porousness and levity—its being so far removed from that decomposition which is essential to the vegetative functions of all soils, and also to its susceptibility of the extremes of excessive moisture and excessive drought—overcharged in wet seasons, and amounting to a mere *caput mortuum* in dry ones.

The resin fuel, alluded to in the foregoing report, is an artificial coal formed by an union of this peat coke and bituminous matter up to the point of saturation. Of the uses and properties of this fuel, as well as of other advantages derivable from the application of peat, I shall, with your permission, on a future occasion, submit to your consideration. I am, &c.,

C. W. Williams.

SCIENTIFIC NOTICES.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from p. 240.)

History and Construction of Westminster Bridge, accompanied with detailed Drawings. By F. Whishaw, M. Inst. C.E.

This account of Westminster-bridge has been extracted from the very voluminous documents in the Westminster-bridge office, access to which was given to the author of this paper by the kindness of Mr. Swinburne, the resident engineer to the bridge.

The first act was passed in 1736, and empowered certain commissioners to raise monies by lottery. Three sites were pitched upon; the Horseferry, over against the Palace-yard, and over against Woolstaple, which latter was finally fixed on. The scheme was violently opposed by the City of London and the Thames watermen. The commissioners selected a very curious and well-designed wooden superstructure, by James King; but having determined that the bridge should be of stone, they accepted a proposal from Mr. Labelye to found one pier by means of caissons, and which he had offered to build at his own expense.

This bridge, so lasting a monument to the genius of Labelye, consists of fifteen semi-circular arches, decreasing regularly in span by 4 feet from the centre, which measures 76 feet, to the sixth arch on each side, which is 52 feet in span; all the arches spring from the line of low water of 1736. The whole distance between the abutments is 1068 feet, with 870 feet clear waterway, and 198 feet solid. A peculiar feature in this bridge is, that the spandils are formed of radiated Purbeck blocks with occasional bond stones, and the interior filled with ballast and rubbish.

The design of Mr. Labelye was the only one for laying the foundations of the piers under water, and the application of caissons for this purpose then first took place. The construction of these caissons and method of founding the piers by means thereof, are fully described and illustrated. The piles were driven by an engine invented by Mr. Valoue, a watch-maker; it was erected on a platform, fixed on the top of a barge, and worked by three horses walking round and turning an upright shaft, on which was fixed a large cog wheel and a drum, on which the rope was wound, and passing by pulleys to the top of the guide frames, was connected with a follower furnished with tongs, as in the common pile engine. The number of strokes in an hour was about 150, at an elevation of 9 feet; the weight of the ram 1700 lbs. The piles were generally cut off; the time occupied in cutting off a pile about 15 inches square and 10 feet under water, being not more than a minute and a half. The construction of the abutments and of the arches is fully described; and the quantity of stone employed in the middle 76-foot arch, and the two adjoining 72-foot, is stated; the expense of these three arches was 24,074*l.*

The centres employed were on the principle of the diagonal truss; for the five middle arches three rows of piles were driven on each side to support the centres, and for the other arches only two rows. Each centre consisted of five ribs of fir timber, resting on transverse and longitudinal oaken plates. The five centres used on the Westminster side were afterwards used for the corresponding arches on the Surrey side; the striking of the centres was first performed by means of circular wedges of a peculiar construction: this mode, however, from its expense, was superseded by straight wedges.

A most interesting portion of the history is that which relates to the 15-feet sunken pier. There was no piling under the caisson bottoms, and the removal of gravel of the bed of the river very near the pier in question, occasioned consequently a sinking. The progress and nature of the sinking are accurately detailed. The south point had settled 14 inches, and the north point 13 inches; and the sinking still going on, it was determined to remove the superstructure above the sunken pier and damaged arches: the sinking still continued, but at last appeared to stop, and the whole amount was found to be 3 feet 4 inches at the north-west angle, and 2 feet 7 inches at the south-east angle, of the pier. Centres were erected under the two damaged arches; the adoption of which plan was recommended to the commissioners in the following words: "If the pier should settle much more, it is not in the power of any mortal agent or agents to hinder the arches from following it, as long as it is possible; and therefore, in that case, the two arches, instead of parting asunder, and their materials falling into the river, and not to be taken up without a great expense of time and money, will be received, and their materials supported and secured, in order to their being regularly unbuilt." The pier, however, lightened as above described, did not continue to sink, and the weight over the piers was considerably reduced by introducing segment arches over the 15-foot pier, and half arches over the adjoining piers, leaving a considerable void space beneath each.

Labelye presented to the commissioners several reports on the open joints, on the sunken pier, on the Surrey New-road, and on the completion of the works. These are most interesting, serving, as they do, to exhibit the state of engineering at that time in the country.

A detailed account is also given of the ingenious wooden superstructure designed by Mr. James King, and of Mr. Batty Langley's design for a wooden bridge at the Horseferry. The author has also collected, at immense pains, the prices of materials and of labour as paid in the erection of Westminster, bridge; he has also compiled a journal of works from the commencement of the undertaking to the time the bridge was opened. These most interesting and instructive documents are collected from the voluminous records deposited in the Bridge-office.

The paper is accompanied by an atlas of eleven drawings, showing the site and all the details of the bridge, with fac-simile signatures of Charles Labelye the engineer, and Messrs. Jelfe and Tufnell the contractors.

List of Patents

Granted in Scotland between 22d December, 1838, and 22d January, 1839.

To Stephen Geary, of Hamilton-place, London, architect, for improvements in the preparation of fuel.—29th December.

— William Brown, of Port Dundas, near Glasgow, in consequence of a communication from a foreigner residing abroad, for a flooring machine, for planeing, reducing to an uniform thickness and breadth, and grooving, feathering, or tongueing wood used for flooring and other purposes.—29th December.

— Henry Huntley Mohun, of Regent's-park, London, M.D., for improvements in apparatus for producing light and heat.—29th December.

— Joseph Davies, of Nelson-square, in the county of Surrey, for a composition for protecting wood from flame.—4th January.

— William Wainwright Potts, of Burslem, china-manufacturer, for certain improvements in machines applicable to the printing or producing patterns, in one or more colours, on metallic preparations, to be transferred to earthenware, porcelain, china, glass, metal, wood, cloth, paper, paper-machée, bone, slate, marble, and other suitable substances.—7th January.

— William Gossage, of Stoke Prior, in the county of Worcester, manufacturing chemist, for certain improvements in manufacturing iron.—12th January.

— Joseph Fraser, of Halifax, Yorkshire, for certain improvements in the apparatus of machinery to be employed as centerings or supporters in the construction of bridges and arches, and in tunnels or other mining operations.—14th January.

— John Fowler, of Birmingham, for certain improvements in preparing or manufacturing sulphuric acid.—14th January.

— Richard Thomas Beek, of Little Stonham, Suffolk, communicated from a foreigner residing abroad, for a new or improved apparatus or mechanism for obtaining power and motion, to be used as a mechanical agent generally, which he intends to denominate rotæ vivæ.—14th January.

To William Brindley, of Birmingham, paper-tray manufacturer, for certain improved arrangements in the construction of screw presses.—17th January.

— John Small, of the Old Jewry, London, merchant, communicated by a foreigner residing abroad, for improvements in the manufacture of thread or yarn, and paper, by the application of certain fibrous materials not hitherto employed.—21st January.

— John Thomas Betts, of Smithfield-bars, London, rectifier, communicated by a foreigner residing abroad, for improvements in the process of preparing spirituous liquors in the making of brandy.—21st January.

— Benjamin Ledger Shaw, of Henley, near Huddersfield, clothier, for improvements in preparing wool for and in the manufacture of woollen cloths, parts of which improvements are applicable to the weaving of other fabrics.—21st January.

— John Chanter, of Earl-street, Blackfriars, London, and Peter Berie, of Dundee, engineer, for improvements applicable to steam boilers.—21st January.

New Patents
SEALED IN ENGLAND.
1839.

To Samuel Clegg, of Sidmouth-street, Gray's-inn-road, engineer, for a new improvement in valves, and the combination of them with machinery.—Sealed 3d January—6 months for inrolment.

To Henry Robert Abraham, of Keppel-street, Russell-square, architect, for improvements in apparatus applicable to steam-boilers.—Sealed 3d January—6 months for inrolment.

To Thomas Nicholas Raper, of Greek-street, Soho, gentleman, for improvements in rendering fabrics and leather waterproof.—Sealed 3d January—6 months for inrolment.

To Abel Morrall, of Studley, Warwick, needle maker, for certain improvements in the making or manufacturing needles, and in the machinery or apparatus employed therein.—Sealed 3d January—6 months for inrolment.

To Louis Mathurin Busson du Maurier, of Lombard-street, gentleman, for improvements in the construction of springs for carriages.—Sealed 3d January—6 months for inrolment.

To Miles Berry, of the Office for Patents, Chancery-lane, patent agent, for certain improvements in rotatory engines to be worked by steam or other fluids.—Sealed 4th January—6 months for inrolment.

To Hickling Burnett, of Wharton-street, Bagnigge Wells-road, gentleman, for new and improved machinery for sawing, planeing, grooving, and otherwise preparing or working wood for certain purposes.—Sealed 8th January—6 months for inrolment.

To Joseph Clisild Daniell, of Limpley Stoke, in the county of Wilts, for an improved method of weaving woollen cloths, and cloths made of wool together with other materials.—Sealed 9th January—6 months for inrolment.

To Moses Poole, of Lincoln's-inn, gentleman, for certain improvements in clogs.—Sealed 11th January—6 months for inrolment.

To John Howarth, of Aldermanbury, manufacturer, for certain improvements in machinery for spinning, roving, doubling, and twisting cotton and other fibrous materials.—Sealed 11th January—6 months for inrolment.

To John Ashton, of Manchester, silk manufacturer, for an improvement or improvements in manufacturing plush of silk or other fibrous materials.—Sealed 11th January—6 months for inrolment.

To John Swain Worth, of Manchester, merchant, for an improved machine for preparing and cleaning wool for manufacturing purposes.—Sealed 11th January—6 months for inrolment.

To William Newton, of the Office for Patents, Chancery-lane, civil engineer, for certain improvements in machines for drilling land, or sowing grain and seeds of different descriptions.—Sealed 11th January—6 months for inrolment.

To Francis Brewin, of the Old Kent-road, tanner, for certain improvements in using materials employed in tanning, and preparing the same for other useful purposes.—Sealed 11th January—6 months for inrolment.

To Robert Logan, of Trafalgar-square, Esq., for a new cloth or cloths constructed from cocoa-nut fibre, and for certain improvements in preparing such fibrous material for the same and other purposes.—Sealed 11th January—6 months for inrolment.

To William Ponsford, of Wangye House, Essex, gentleman for an improvement in themanufacture of hats, and an improved description of felt suitable for hats and various other useful purposes, and improvements in preparing the material or materials chiefly used in the manufacture of such felt—Sealed 12th January—6 months for inrolment.

To Edwin Martin, of the village of Brasted, in the county of Kent, plumber, for his invention of an improved method of laying coverings, composed of lead or other metal, on the roof of houses, or other buildings, with drains, whereby the part of the water falling on such roof, which would otherwise penetrate, is carried off, and rolls and seams are rendered unnecessary.—Sealed 12th January—6 months for inrolment.

To Joseph Burch, of Bankside, Blackfriars, calico-printer, for his invention of certain improvements in printing cotton, woollens, paper, and other fabrics and material.—Sealed 15th January—6 months for inrolment.

To William Witham, of Huddersfield, machinist, for improvements in engines to be worked by steam, water, or other fluids.—Sealed 15th January—6 months for inrolment.

To Hugh Ford Bacon, of Fen Drayton, Cambridge, clerk, for an improvement or improvements in apparatus for regulating the flow or supply of gas through pipes to gas burners, with a view to uniformity of supply.—Sealed 17th January—6 months for inrolment.

To William Holme Heginbotham, of Stockport, in the county of Chester, gentleman, for certain improvements in machinery or apparatus for propelling boats or other vessels to be employed either for marine or inland navigation, and to be worked by steam or other power.—Sealed 17th January—6 months for inrolment.

To William Newton, of the Office for Patents, Chancery-lane, civil engineer, for certain improvements in engines to be worked by air or other gases, being a communication.—Sealed 17th January—6 months for inrolment.

To Oglethorpe Wakelin Barratt, of Birmingham, metal gilder, for certain improvements in the process of decomposing muriate of soda for the manufacture of mineral, alkali, and other valuable products.—Sealed 19th January—6 months for inrolment

To Joseph Garnett, of Haslingden, in the county of Lancaster, dyer, for certain improvements in machinery or apparatus for carding cotton, flax, wool, or any other fibrous substances.—Sealed 19th January—6 months for inrolment.

To Richard Dugdale, of Thayer-street, Manchester, engineer, for a method or methods of increasing the security, tenacity, and strength of beams, axles, rods, and other articles made of iron and steel.—Sealed 19th January—6 months for inrolment.

To Caleb Bedells, of Leicester, manufacturer, for an improvement in gloves, stockings, and other articles of hosiery.—Sealed 21st January—2 months for inrolment.

To John Coope Hadden, of Bazing-place, Waterloo-road, civil-engineer, for improvements in machinery or apparatus for propelling vessels and boats by steam or other power.—Sealed 22d January—6 months for inrolment.

To George Stevens, of Stowmarket, Suffolk, brewer, for certain improvements in stoves.—Sealed 22d January—6 months for inrolment.

To John Horrocks Ainsworth, of Halliwell, Lancaster, bleacher, for certain improvements in machinery or apparatus for stretching, drying, and finishing woven fabrics.—Sealed 24th January—6 months for inrolment.

To Thomas Dowling, of Chapel-place, Oxford-street, gentleman, for improvements in preparing metals for the prevention of oxydation.—Sealed 24th January—6 months for inrolment.

To Robert Copland, of Courland, Wandsworth-road, for improvements in water-wheels.—Sealed 24th January—6 months for inrolment.

To Pierre Jean Isidore Verdun, of the Sabloniere-hotel, Leicester-square, gentleman, for improvements in the manufacture of starch; and in machinery for preparing and in employing of the refuse matters obtained in such manufacture.—Sealed 25th January—6 months for inrolment.

To John Howard Kyan, of Cheltenham, Esq., and William Hyatt, of Lower Fountain-place, City-road, engineer, for improvements in steam engines.—Sealed 29th January—6 months for inrolment.

To John Hillard, of Bread-street, Cheapside, merchant, for certain improvements in machinery or apparatus for making or manufacturing screws.—Sealed 29th January—6 months for inrolment.

To William Lukyn, of Lower Cowley-house, Oxford, dentist, for certain improvements in applying and attaching artificial and natural teeth.—Sealed 29th January—6 months for inrolment.

To Thomas Collette, of Aylesbury, in the county of Buckingham, for improvements in children's cots.—Sealed 29th January—2 months for inrolment.

To Charles James Blasius Williams, of Half-Moon-street, Piccadilly, Esq., M.D., for certain improvements in two-wheeled carriages.—Sealed 29th January—6 months for inrolment.

To Robert Carey, of Breadgar, near Sittingbourne, in the county of Kent, gentleman, for certain improvements in paving or covering streets, roads, or other ways.—Sealed 29th January—6 months for inrolment.

To Frank Hills, of Deptford, in the county of Kent, manufacturing chemist, for his invention of certain improvements in the construction of steam boilers and of locomotive engines.—Sealed 29th January—6 months for inrolment.

CELESTIAL PHENOMENA, FOR FEBRUARY, 1839.

D.	H.	M.	
1			Clock before the sun, 13m. 52s.
	—		☽ rises 8h. 11m. A.
	—		☽ passes mer. 2h. 4m. M.
	—		☽ sets 8h. 53m. M.
			Encke's Comet R. A. 19h. 46m. dec. 27. 31.
			Ditto passes mer. 23h. 0m.
	5	44	♂ stationary.
	14	29	☿ in descending node.
	17	40	♃'s second satt. will im.
			Occul. Π Leonis, im. 10h. 12m. em. 10h. 53m.
2	10	51	♂ in conj. with the ☽ diff. of dec. 4. 32. N.
	18	46	♃ stationary.
3	23		☽ in Apogee.
	23	43	♃ in conj. with the ☽ diff. of dec. 3. 55. N.
			Occul. 50 Virg., im. 18h. 18m. em. 19h. 25m.
5			Clock before the sun, 14m. 18s.
	—		☽ rises morn.
	—		☽ passes mer. 4h. 43m. M.
	—		☽ sets 9h. 33m. M.
			Encke's Comet R.A. 19h. 59m. dec. 27. 0.
			Ditto passes mer. 22h. 43m.
	22	59	♀ greatest hel. lat. S.
6	6	41	☽ in □ or last quarter.
7	14	52	♃'s first satt. will im.
8	3	16	♄ in conj. with the ☽ diff. of dec. 6. 54. N.
10			Clock before the sun, 14m. 33s.
	—		☽ rises 5h. 42m. M.
	—		☽ passes mer. 8h. 52m. M.
	—		☽ sets 0h. 2m. A.
			Encke's Comet R. A. 20h. 13m. dec. 26. 19.
			Ditto passes mer. 22h. 51m.
11	17	48	☿ in Aphelion.
12	1	37	☿ in conj. with the ☽ diff. of dec. 2. 57. N.
14	—		Mercury R. A. 18h. 17m. dec. 22. 33. S.
	—		Venus R. A. 22h. 45m. dec. 9. 32. S.
	—		Mars R. A. 12h. 2m. dec. 3. 52. N.
	—		Vesta R. A. 5h. 58m. dec. 24. 20. N.
	—		Juno R. A. 21h. 0m. dec. 10. 29. S.
	—		Pallas R. A. 13h. 26m. dec. 1. 15. S.
	—		Ceres R. A. 13h. 45m. dec. 4. 4. N.
	—		Jupiter R. A. 13h. 9m. dec. 5. 52. S.
14			Saturn R. A. 16h. 32m. dec. 20. 5. S.
	—		Georg. R. A. 22h. 52m. dec. 7. 57. S.
	—		Mercury passes mer. 23h. 1m.
	—		Venus passes mer. 1h. 9m.
	—		Mars passes mer. 14h. 24m.
	—		Jupiter passes mer. 15h. 33m.
	—		Saturn passes mer. 18h. 54m.
	3	28	Ecliptic conj. or ● new moon.
	16	11	♀ in conj. with the ☽ diff. of dec. 0. 5. S.
	18	31	♅ in conj. with the ☽ diff. of dec. 0. 33. N.
15			Clock before the sun, 14m. 28s.
	—		☽ rises 8h. 2m. M.
	—		☽ passes mer. 1h. 29m. A.
	—		☽ sets 7h. 12m. A.
			Encke's Comet R. A. 20h. 26m. dec. 25. 36.
			Ditto passes mer. 22h. 45m.
	16		☽ in Perigee.
16			Vesta stationary.
	11	14	♃'s first satt. will im.
19	11	29	♃'s second satt. will im.
	15	51	☿ in conj. with Juno diff. of dec. 8. 23. S.
			Occul. 47 Arietes, im. 4h. 36m. em. 5h. 49m.
20			Clock before the sun, 14m. 5s.
	—		☽ rises 9h. 20m. M.
	—		☽ passes mer. 5h. 49m. A.
	—		☽ sets 1h. 10m. M.
			Encke's Comet R. A. 20h. 39m. dec. 24. 53.
			Ditto passes mer. 22h. 37m.
	7	50	☽ in □ or first quarter.
	9	36	Ceres stationary.
23	13	7	♃'s first satt. will im.
			Occul. 47 Gemi., im. 11h. 2m. em. 12h. 8m.
24			Pallas stationary.
25			Clock before the sun, 13m. 24s.
	—		☽ rises 2h. 7m. A.
	—		☽ passes mer. 10h. 30m. A.
	—		☽ sets 6h. 12m. M.
			Encke's Comet R. A. 20h. 50m. dec. 24. 10.
			Ditto passes mer. 22h. 29m.
26	14	3	♃'s second satt. will im.
27	12	25	♃'s third satt. will em.
28	8	36	Ecliptic oppo. or ○ full moon.
	18	28	♄ in □ with the ☉.
			Occul. τ Leonis, im. 16h. 57m. em. 17h. 31m.

J. LEWTHWAITE, Rotherhithe.

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CONJOINED SERIES.

No. LXXXIV.

Recent Patents.

To Joseph Lincoln Roberts, *of Manchester, in the county palatine of Lancaster, merchant, for an invention of a certain improvement or certain improvements in looms for weaving, being a communication from a certain foreigner residing abroad.*—[Sealed 15th April, 1837.]

These improvements in looms for weaving apply particularly to those looms which are intended for the purpose of weaving knotted counterpanes and such other figured fabrics as may be woven by the said machinery, where the warp or weft is raised from the surface in knots or loops, in order to compose or form a pattern upon the surface of the fabric; and my improved loom properly consists of two parts or divisions; first, that which weaves the cloth or forms the fabric; second, that by which the figures are wrought.

The first part or division of the loom is described as follows:—The frame consists of four upright posts *a, a, a, a,* see figs. 1, 2, 3, and 4, Plate XIV.; *b, b, b, b,* are cross rails, which connect the posts together; *c, c, c,* are cross horizontal rails for the same purpose of connecting the ends of the framework; *v,* is a platform for the weaver to stand upon; *d,* represents the beam or roller on which the yarn is wound before weaving; *e, e,* are weights suspended by friction straps, passing over the heads of the beam *d,* to keep the warp at a proper degree of tension, and to allow it to unwind as fast as it is filled by the woof, when beaten up by the lay; *f,* is a roller, over which the yarn passes to change its direction; *g,* is the breast beam, over which the cloth passes; *h,* is the cloth roller, for receiving what has been completed; *i,* is a ratchet wheel and pinion; *i,* is a lever for communicating motion from the lay to the cloth roller; *k, k,* are catches to secure the roller while the lever *i,* is acted upon by the lay; *l, l,* are treadles, which are acted on by the weaver's feet; *m, m,* represent straps, which communicate motion from the treadles *l, l,* to the straps *c, c,* which shafts continue the motion by means of the bevel gears *p, p,* to the rollers *q, q*; *r, r,* are straps, for connecting the rollers *q, q,* with the heddles which raise and depress the warp to receive the shuttle; *t, t,* are straps, by which the heddles are suspended from the roller *s,* supported by the stands *u, u.* The roller *s,* turns on its axis in opposite directions as the heddles are raised or depressed; *v,* is the axis on which the lay vibrates. The supporting parts of the lay, called swords, appear at *w, w*: *x,* is a cross rail between the swords; *y,* represents the race beam, upon which the shuttles slide, and to which the lower edge of the reed is attached; *z,* is the top shell of the lay, which receives the upper edge of the reed; *p, p,* are rods, bent as represented in the drawing, with their extremities made fast to the post *a,* and the cross rail *b*; *q, q,* are stands screwed to the race beam, playing on the rods p, p: r, r, represent springs encircled on the rods p', p'; one extremity of each spring abuts against the pin inserted in the rods p, p; the other extremity presses against the stands q', q'. The object of the springs is to counteract the weight of the lay, and render it more easily moved by the weaver: s', s', are studs, extending from the breast beam g, to prevent the lay passing beyond a given point, when it is brought forward to beat up the woof.

The double shuttle boxes are visible at a'; b, b, are the pecker rods or spindles, made fast in the stands c', c', on which the peckers or drivers d', d', slide; e', e', e', are pecker strings, which connect the drivers d', d', with the handle f'. The drivers are driven forward alternately, by the weaver grasping the handle f', the force of which motion lodges the shuttle in the box at the end of the lay, opposite to the driver that is drawn forward; x, y, are pulleys with springs encircled on their axes. The object of the springs and pulleys is to take back the peckers after they have been drawn forward by the weaver; z', z, are strings, which connect the peckers with the pulley x, y.

From what has been explained, it would appear that only one shuttle would be put in motion; but as two are employed, an apparatus is added by which they are brought alternately before the drivers d', d', being described as follows:—g, g, are V's, upon which the shuttle boxes slide with a horizontal reciprocating motion: h', h', are screws to regulate the degree of motion of the shuttle boxes; i', i', i', i', represent arms extending from the shaft j, with their lower extremities passing through mortices made in pieces of iron l', l', screwed at the bottom of the shuttle boxes; k', k', are stands which support the shafts j'; o', represents the handle which the weaver grasps, and by giving to it an oscillating motion, shifts the boxes.

We now come to the second part or division of the loom, which accomplishes its object by three principal operations: first, that which regulates the variations in the pattern or figures, adjusts the springs and stop bar, raises the hooks or dents, and prepares the woof to be acted on by them; second, that which sinks the hooks to form the knots which compose the figure; third, that which releases the hooks from the knots, and allows them and other parts of the machinery to return to their former positions.

The first operation is described as follows:—*a,* is a pulley revolving on the first shaft *b"*, receiving motion from the millwork by the belt *c,* and giving motion to the machinery to produce the first operation, when the clutch *d"*, connects it with the shaft *b"*. The clutch *d"*, by its reciprocating motion through the chuck *f"*, which is made fast to the shaft *b"*, connects and disunites the shaft *b"*, with the pulley *a"*: motion is given to the clutch *d"*, to form this connexion, by the shifting rod *g"*, which the weaver grasps at the ball *h"*, and slides in the stands *i"*, *i"*, towards the right. This gives motion to a lever, whose long arm *j,* is connected with the rod *g"*, by means of a mortice, through which it passes. The shaft *k"*, turning on bearings in stands *l"*; *l,* is the fulcrum of the lever; *m"*, is the short arm which, by pressing against the spring *n"*, overcomes its elastic force. The upper part of the spring is made fast to the cross rail *o"*, while its lower extremity plays in a groove in the clutch *d"*: *p"*, is a spring attached to the spring *n"*, and locks or catches on the stand *q"*, when the clutch *d"*, is brought in contact with the studs extending from the pulley *a"*, and thus secures the connexion between the pulley *a"*, and the shaft *d"*; *r,* represents a cogged wheel, which takes into the cogged wheel *s"*, and revolves the shaft *t"*, on the axis. Attached to the shaft *t"*, are three wipers or cams, from which the three principal motions of the first operation are derived. The first motion has for its object to regulate the variations made in the pattern or figure, which is effected in the following manner:—The arm *u*", receives an oscillating motion from the wiper *v*", and turns the shaft *w*; on its axis *x*", *x*", are arms, extending from the shaft *w*", which oscillate as the shaft *w*", turns on its axis alternately in different directions: *y*", *y*", are connecting bars, which communicate the oscillating motion from the arms *x*", *x*", to the prism frame *z*": *a*", is the axis on which the prism frame vibrates; *t*", represents a spring, attached at one end to the bar *y*", and at the other extremity to the cross rail *c*. The object of this spring is to take back the prism frame after it has been drawn forward by the cam *v*"; *b*, represents a four-sided prism, having as many holes bored in each side as there are knots to be raised in any thread of the woof, and to correspond in number with the hooks or dents which act on the filling. It also has projecting points or teeth *u*', *u*', *u*'; the object of which is to enter holes made in the pattern card, so as to bring the remaining holes in the pattern card directly over the holes in the prism: *c* 3, is a double pall, shaped as seen in fig. 11, and vibrates on a pin which connects it to a stand on the framework of the machine.

The prism is made to turn one quarter revolution at each oscillation, by means of the upper hook of the double pall *c* 3, retaining one corner; while the other part is carried out. When the figure to be woven is half completed, it is necessary to reverse the motion of the prism, to turn back the pattern card. This is effected by attaching a spring to the projecting arm of the double pall *c* 3, which brings the lower hook of the double pall *c* 3, to act on the prism. The hooks of the double pall 3^{3} turn the prism, by acting on the friction rollers of a wheel *d* 3, on the extremity of its axis. This wheel may be constructed of two parallel plates, having four holes drilled in each opposite to each other, and corresponding in position with the corners of the prism, to serve as bearings for four small cylinders or friction rollers, which serve the same purpose as the teeth of a ratchet wheel: *e* 3, is a piece of iron or other metal, shaped in the form of a T, and moving in proper supports attached to the prism frame; *f* 3, is a spiral spring, encircled on the upright part of the T, *e* 3, and forces it against the friction rollers in the wheel *d* 3, to prevent the prism from turning, except by the action of the hooks of the double pall *c* 3; *g* 3, *g* 3, *g* 3, represent as many horizontal wires as there are holes bored in each side of the prism: they are so arranged as to slide in holes drilled in the plates of iron *h* 3; *i* 3, *j* 3, screwed to the cross rails *k* 3, *l* 3. Between the plates of iron, screwed to the cross rail *k* 3, a spiral spring *m* 3, is encircled around each horizontal wire *g* 3, *g* 3, *g* 3, and attached thereto at one end by a pin inserted in the horizontal wire *g* 3. This pin also serves the purpose of a shoulder, to prevent the return of the horizontal wire beyond a proper distance. The opposite end of the spring *m* 3, abuts against the plate of iron *j* 3: this spring yields to any gentle pressure on the end of the horizontal wire *g* 3, projecting beyond the cross rail *l* 3, and returns to its place again when that pressure is removed. In the end of each horizontal wire projecting beyond the cross rail *k* 3, is an eye, through which a wire *n* 3, passes, hooked at one end, and arranged vertically over the lifting bar *s* 3. The wire *n* 3, is more particularly described hereafter.

The ends of the horizontal wires projecting beyond the cross rail *l* 3, are so arranged as to enter the holes of the prism as it swings towards them. If this was the whole of the apparatus, it is evident that the prism *b* 3, could produce no effect on the horizontal wires *g* 3, *g* 3, for the ends of them being received at each swing of the prism into the corresponding holes of the prism, all pressure on the same would be avoided.

If we cover each face of the prism as it is brought successively against the ends of the horizontal wires, with a piece of pasteboard *o* 3, called a pattern card, pierced with holes corresponding to those of the prism, and opposite to certain of the horizontal wires, which it may be necessary to have remain at rest, it is evident that all the other horizontal wires will be pushed forward; thus withdrawing the hooked wires *n* 3, *n* 3, with which they are connected, from the action of the lifting bar, which, when raised, will carry up with it only those hooked wires *n* 3, *n* 3, which have not been pushed back, or, in other words, those the horizontal wires of which were opposite to the holes in the pattern card *o* 3. Thus, any variation may be made in the figure or pattern, by a corresponding variation in the pattern card.

The object of the next motion is to raise the hooks, and prepare the woof to be acted on by them. This is accomplished as follows:—An oscillating motion is given to the arm *p* 3, by the wiper or cam *q* 3: this turns the shaft *r* 3, on its axis, and raises the lifting bar *s* 3, which is connected to the shaft *r* 3, by the arms *t* 3, and the bars *u* 3, *u* 3. When the lifting bar *s* 3, is raised, it carries with it those hooked wires *n* 3, *n* 3, which were not pushed forward by the horizontal wires, as before described. The hooked wires *n* 3, *n* 3, are connected with a joint, with the levers *v* 3, *v* 3, and raise those ends of them to which they are attached; *w* 3, *w* 3, are the fulcra on which the levers turn; *x* 3, represents a rack having suitable guides, between which the ends of the levers are inserted, and play during their motion up and down; *y* 3, *y* 3, *y* 3, represent vertical wires, which are attached at their lower ends by a hinge joint to the levers *v* 3, *v* 3, and at their upper ends to the hooks or dents *z* 3, *z* 3. They communicate motion from the levers *v* 3, *v* 3, to the dents or hooks *z* 3, *z* 3. The hooks *z* 3, *z* 3, compose every fourth dent of the reed, and are made to slide in the bands of the reed with a vertical reciprocating motion.

The moveable hooks *z* 3, *z* 3, are more particularly shown in fig. 6, and are shaped and formed as therein seen. On each side of the hook is a piece of copper or other metal *a* 4, bevelled at the top, its object being to separate the threads of the warp when the hooks are raised, so as to prevent any accident which might occur by the points of the hooks catching the threads of the warp while going down. The reed is similar in construction to those in common use in other looms, with the exception that next to every third dent is placed one of the moveable dents which act on the woof or filling. The number of moveable dents, and, of course, the number of fast dents between them, are regulated by the kind of fabric to be manufactured: thus, instead of three fast and a moveable dent, as above mentioned, there may be four or more, at pleasure, and a moveable dent next in order, as seen in fig. 4, where *b* 4, *b* 4, *b* 4, represent the fast, and *z* 3, the moveable dents.

The construction of the reed, or that part of it which relates to securing the dents, differs somewhat from the mode usually adopted in reeds in common use. There are two strips or bands of iron at the upper and lower edge of the reed, between which the ends of the dents are inserted. A notch is formed on the under and upper edge of each band on either side of each moveable dent; the dents are then secured in the bands by means of a wire properly wound between them around the bands, which being received into the notches, prevents the moveable dents from becoming misplaced by the operation of the loom or otherwise: the fast dents are soldered or otherwise fastened together at the top, to prevent their dropping out in case they are not made secure by the wire wound between them.

An arm *c* 4, similar to the arm *t* 3, extends from the shaft *r* 3, (being hid in the drawing by the arm *t* 3.) Attached to the arm *c* 4, is a strap *d* 4, which when the strap *r* 3, turns on its axis, communicates motion to the pulley *e* 4; *f* 4, represents a spring, which locks or catches into a notch made in the circumference of the pulley *e* 4, when it has completed that part of a revolution it is caused to make by the strap *d* 4, and prevents it from turning when the strap *d* 4, is slackened, as the shaft *r* 3, turns to depress the lifting bar 5^3: *g* 4, is a strap which communicates motion from the pulley *e* 4, to the shaft *h* 4; *w* 1, is a small pulley on the axis of the lay to guide the strap *g* 4, so that during the vibrations of the lay it shall preserve an uniform tension. Attached to the shaft *h* 4, are three wipers or cams *i* 4, *i* 4, *i* 4, which impart an upward motion to three vertical rods *j* 4, *j* 4, *j* 4, placed over them; attached to the top of the rods is a piece of metal *k* 4, called the race piece, which is raised by the rods *j* 4, *j* 4, to touch the lower shed of the warp while the moveable dents or hooks are acting on the filling grooves *l* 4, *l* 4, are made in that edge of the race piece presented to the reed, corresponding in number and position with the moveable dents, the hooked parts of which pass through the grooves as the dents move up and down in the bands of the reeds. The race piece *k* 4, supports the woof as it is acted on by the hooks, and thus makes the knots of an uniform length: *m* 4, is a strap which receives motion from the pulley *e* 4, and communicates it to the shaft *n* 4, by the means of the arm *o* 4, to which it is attached; *n* 4, is a shaft extending horizontally across the loom, supported by the stands *p* 4, *p* 4. To this shaft are attached the pieces of metal *q* 4, *q* 4, shaped and formed as seen in figs. 4, and 5. Attached to their upper surface are upright pieces *r* 4, *r* 4, to serve as supporters and guides for the wires *s* 4, *s* 4: the wires *s* 4, *s* 4, slide in holes in the top of the pieces *r* 4, *r* 4: *t* 4, *t* 4, are arms affixed by a screw to the wires *s* 4, *s* 4, and slide in slots made in the pieces of metal *p* 4, *p* 4; *u* 4, is a spiral spring, which encircles the wire between the arm *t* 4, and the upright piece *r* 4; *v* 4, is a lever, whose fulcrum is at *w* 4, having one arm jointed at *x* 4, to the piece *y* 4. The joint *x* 4, is so constructed that the piece *y* 4, cannot fall below a horizontal line: *z* 4, is a projection from the shaft *n* 4; and *a* 5, is another from the race beam *y*: *b* 5, is a spiral spring, with one end attached to the lever *v* 4, and the other to the breast beam; *c* 5, is a spiral spring, encircled around the shaft *n* 4, having one end attached to the shaft, and the other to the breast beam.

The object of this apparatus is to push the filling under the hooks to be acted on by them to form the knots; this is effected as follows:—The strap *m* 4, brings down the apparatus to a level with the top of the race beam, thereby causing the points of the wires *s* 4, *s* 4, to pass down behind the woof; at the same time the shaft *n* 4, turning, allows the short arm *y* 4, of the lever *v* 4, to fall to a horizontal position: the lay coming forward, until it meets the stops *d* 8, *d* 8, projecting from the underside of the pieces of metal *q* 4, *q* 4, causes the projection *a* 5, to strike against the side of the arm *y* 4, which pushes the other arm of the lever and the wires *s* 4, *s* 4, forward towards the reed, carrying the filling along with it under the hooks.

The third motion adjusts the stop bar and the springs, which support and prevent the levers from falling by their gravity when the lifting bar, by which they are raised, returns to its place. The arm *e* 8, receives motion from the wiper or cam *d* 5, and turns the shaft *e* 5: *g* 5, *g* 5, are connecting bars, jointed at one end of each to the arms *f* 5, *f* 5;

and at the other end to the levers *h* 5, *h* 5; *i* 5, *i* 5, are upright rods, which slide with a vertical reciprocating motion, in suitable stands, and serve to support the stop bar *j* 5. This stop bar *j* 5, receives the ends of the levers as they are forced down by the cylinders, and regulates the degree of motion thus given to the hooks or dents *z* 3, *z* 3 : *k* 5, *k* 5, represent springs arranged vertically before the levers *v* 3, and made fast at the bottom to the stop bar *j* 5. The ends of the levers *v* 3, *v* 3, rest upon the ends of the springs, and are supported by them. The springs yield to any upward pressure made on the opposite ends of the levers *v* 3, and allow them to sink down to the stop bar. When the levers strike the stop bar *j* 5, the shoulders of the springs lock or catch on the ends of them, and prevent them from being raised by the resistance of the woof, as it is acted on by the moveable hooks or dents *z* 3. As the hooks are forced down by the motion of the levers, they act on the woof, and force it into their corresponding grooves in the race piece, thus making the knots which compose the pattern or figure.

The cams or wipers on the shaft *t* 4, are so shaped as to give the three principal motions of the first operation relatively as follows:—The prism is first brought forward to push back the hooked wires; then the lifting bar, the springs, and stop bar rise up simultaneously, and immediately as the lifting bar arrives at its destination, it returns again to the place from whence it started; when the lifting bar has descended, the prism returns to its former position.

The first operation being completed, the stud *z* 6, projecting from the cogged wheel *s* 4, unlatches the spring *p* 4, thereby releasing the spring *n* 4, which, by its elastic force, withdraws the clutch *d* 4, from the studs extending from the pulley *a* 4, and thus destroys the connexion between the pulley *a* 4, and the shaft *b* 4. After this connexion is destroyed, the stud *a* 7, projecting from the cam or wiper *v* 4, strikes against a shoulder projecting from the upright bar *b* 7, and prevents the cams from passing beyond a given point by their momentum. As it is evident that so much of the woof must draw in from the shuttle as is required to form the knots, it is necessary, in order to prevent the moveable dents from cutting it off by the downward motion, that each should act on the woof successively, that is, one after the other.

The second operation of the machinery accomplishes the above object, and may be understood as follows:—*l* 5, is a pulley, which revolves on the shaft *m* 5, receiving its motion from the millwork; *n* 5, is a clutch, which slides with a horizontal reciprocating motion, and connects and disunites the pulley *l* 5; with the shaft *m* 5, motion is given to the clutch *n* 5, to form this connexion by means of the shifting rod *o* 5, which the weaver grasps at the ball *p* 5, and slides towards the right: this moves a lever, whose long arm *q* 5, is connected with the rod *o* 5, by means of a mortice, through which it passes. The shaft *v* 5, is the fulcrum; *s* 5, is the short arm which passes against the spring *u* 5, and overcomes its elastic force. The spring *u* 5, is made fast to the post of the frame, with the other extremity playing in a groove in the clutch *n* 5; and *v* 5, represents a lever which extends across the loom, with its fulcrum *w* 5, in the centre, fig. 8, attached to the frame *x* 5, is a spiral spring, which exerts an upward force on that arm of the lever to which it is attached. When the spring *u* 5, is acted on by the short arm *s* 5, to bring the clutch *u* 5, in contact with the pulley *l* 5, the lever *v* 5, is drawn upward, and abuts against the stud *z* 5, extending from the side of the spring *u* 5, and thus secures the connexion between the pulley *l* 5, and the shaft *m* 5: *a* 6, *b* 6, *c* 6, represent cylinders, which are arranged horizontally across the loom in the frame *d* 6, resting on the cross rails *b*, *b*;

e 6, *e* 6, *e* 6, are stands, which support the ends of the axis of the cylinders; *f* 6, *f* 6, represent teeth or spurs, which are inserted in suitable positions relative to each other in the surface of each cylinder. When the cylinder *a* 6, revolves on its axis, the first tooth or stud in the cylinder *a* 6, strikes the first or outside of the series of levers *v* 3, *v* 3, and forces the reverse end down to the stop bar: the tooth inserted next in order to the first strikes the second lever at another instant of time, and so on, until each tooth has acted on the corresponding lever, and forced each moveable dent connected with it successively into its corresponding groove in the race piece, and formed the knots.

For all the purposes of the loom, one cylinder only would be necessary, provided we could make use of one of a suitable size. It will be seen, as each tooth on the surface of the cylinder must be at a certain distance, both horizontally and longitudinally, from the next succeeding tooth; and as their longitudinal distances apart from their centre must be equal to the distances between the centres of their corresponding levers, and as each tooth is obliged to move through a certain arc of a circle, to give a suitable degree of motion to the lever on which it acts before the next succeeding tooth begins to act on the next succeeding lever, that, where a great number of levers are employed, the cylinder must be very large; therefore, we make use of three or more, according to their size, or the width of the loom. The first of these cylinders, on completing its revolution, is succeeded by the revolution of the second; which last, as soon as completed, is succeeded by the revolution of the third cylinder: each cylinder must perform an entire revolution before the other commences, in order that the action of the teeth of the second cylinder shall not take place until that of the first is fully completed. On the end of the axis of the first cylinder is fixed a dog or piece of metal with a projection from its end, or a pin inserted and projecting therefrom. To the end of the axis of the second cylinder, which lays directly against the end of the axis of the first, is affixed a circular plate, having a projecting rim; in this rim is formed a slot or opening, of such a size as to allow the end of a click, the reverse end of which vibrates on the axis, to move through a sector of a circle, which, in reversing the motion of the cylinder, would be lost by the dog and click if the dog struck, as the cylinder *a* 6, revolves in either direction against a fixed stud or projection from the plate.

It will be seen by the construction of the dog and click, that when the motion of the cylinders is reversed, the click is in a certain position against one end of the slot, and that when the cylinder *a* 6, moves in an opposite direction, the dog comes round and strikes against the opposite side of the click, which moves forward to the opposite end of the slot, and allows the centre of the dog to complete an entire circumference of a circle before it moves the cylinder *b* 6: between the second and third cylinders are also another dog and plate similar to the one above described. The first cylinder, on completing its revolution, communicates motion to the cylinder *b* 6, which, after acting on all the levers corresponding with its teeth, in a similar manner to the first cylinder, or, in other words, when it has completed one entire revolution, communicates motion to the cylinder *c* 6.

The cylinder *c* 6, operates on the levers similarly to the aforesaid cylinders, and when it has completed its revolution, the stud *g* 6, in the end of the piece of metal *h* 6, acts on the lever *i* 6, which, by means of the connecting wire *j* 5, raises one arm of the lever *v* 5, depresses the reverse arm, and releases the spring *u* 5, which, by its elastic force, withdraws the clutch *n* 5, from the studs extending from the pulley *l* 5, and destroys the connexion between the pulley *l* 5, and the shaft *m* 5 : *k* 6, is a catch, which receives a shoulder of the stop *m* 6, and prevents the cylinders from turning beyond a given point by their momentum, after the connexion is cut off between the pulley *l* 5, and the shaft *m* 5; *l* 6, is a vertical lever, whose fulcrum is connected with the framework, and its lower end with the said catch *k* 6 : the object of the lever *l* 6, is to withdraw the catch *k* 6, from the shoulder of the stop *m* 6, in order to allow the revolution of the cylinder when it is again employed to act on the levers. The lever *l* 6, is put in motion by means of a stud attached to the connecting bar *y*''; *n* 6, is a spring attached to the catch *k* 6, to prevent the catch *k* 6, from returning under the shoulder of the stop *m* 6, and prevents the cylinder *c* 6, from rebounding, when the shoulder of the stop *m* 6, strikes against the catch *k* 6, as above described: *p* 6, *p* 6, are springs having one extremity of each attached to the stand *q* 6, and the other end of each connected with the catches *k* 6, *o* 6, to bring them under the shoulders of the stop *m* 6. The cylinder *a* 6, is prevented from rebounding by means of a stud *r* 6, projecting from its right end, which strikes against a projection *s* 6, from the upper side of the lever *u* 6, whose fulcrum is at *t* 6. The lever *u* 6, is held up by a spring attached to it and the framework.

The third operation, which consists in releasing the hooks from the knots, and allowing them and other parts of the machinery to return to their former positions, is described as follows:—The weaver presses his foot on the treadle *v* 6, and raises the stop bar *j* 5, which acts on the ends of the levers *v* 3, *v* 3, resting upon it, pushes them upward, and the moveable dents connected with them. But before the weaver presses his foot on the treadle *v* 6, he crosses the threads of the warp to secure the knots, and prevent the hooks, during their upward movement, from carrying any portion of the filling with them. The lay is then moved back to carry the hooks away from the filling, that they may not act on it when they return down to their places. The weaver next removes his foot from the treadle *v* 6, and allows the stop bar to descend, which is assisted in its motion downward by the action of the spring *x* 6: *y* 6, is a bar attached to stands made fast to the stop bar, and arranged horizontally over the ends of the levers *v* 3, *v* 3, *v* 3. The object of the bar *y* 6, is to ensure the downward motion of all the levers *v* 3, should any of them be obstructed by the hooks connected with them binding in the reed or warp.

As the weaver pushes down the treadle *v* 6, he performs two other operations: the first brings down the race piece *k* 4, and raises the apparatus which guides the woof under the hooks; the second releases the cams from the stop bar *b* 7, turns them a little to allow the arm *e* 8, to pass down to its lowest position on the cam.

The depressing of the race piece *k* 4, and raising the apparatus which guides the woof under the hooks, may be described as follows:—The arm *c* 7, moving with the shaft *e* 5, presses on the spring *f* 4, and releases it from the pulley *e* 4. The spring *c* 5, being thus relieved, acts on the shaft *n* 4, and causes the apparatus which guides the woofs under the hooks to fly upward; at the same time the spring *f* 8, draws down the belt *g* 8, and thus turns back the shaft *h* 4, and cams *i* 4, and allows the race piece to fall by its own gravity.

The releasing of the cams from the bar *b* 7, and turning them a little to allow the arm *e* 8, to pass down to its lowest position on the cam, is thus described:—The wiper *d* 7, turning with the shaft *c* 5, acts on the upright bar *b* 7, pushes it off, and releases the stud *a* 7, from the projection on the bar *b* 7: the bar *b* 7, by means of a hook *e* 7, jointed to the top of bar *b* 7, which locks on a stud extending from the wiper *v* 4, turns the cams or wipers a little on their axis, and allows the arm *e* 8, to pass down to the small part of its cam when the weaver removes his foot from the treadle *v* 6, to sink the hooks.

As the weaver removes his foot from the treadle *v* 6, two other operations are also performed; the first is to relieve the projection *s* 6, of the lever *u* 6, from the stud *v* 6, to allow the revolution of the cylinder *a* 6, when its motion is reversed; the second is to form a connexion between certain parts of the machinery to communicate a reversed motion to the cylinders *a* 6, *b* 6. The projection *s* 6 of the lever *u* 6, is thus relieved from the stud *r* 6. As the shaft *e* 5, turns, the arm *f* 7, presses downward the bent end of the lever *u* 6, and releases the stop *r* 6, from the projection *s* 6.

The mode of forming a connexion between certain parts of the machinery to communicate a reversed motion to the cylinders *a* 6, *b* 6, is thus described:—On the shaft *e* 5, is fixed a projecting arm *g* 7, having in its end a tongue *h* 7, acted on by a spring *i* 7, in a similar manner to a blade and spring of a penknife; which spring, when the shaft turns by the weaver's foot being pressed on the treadle, yields, and allows the tongue to pass under the end of the lever *k* 7. On the return movement of the shaft *e* 5, as the weaver removes his foot from the treadle, the ends of the tongue *h* 7, strikes against the end of the lever *k* 7, pushes the reverse arm in an opposite direction, and releases the lever *l* 7, which lever is drawn sideways by the spring *m* 7, and brings the clutch *n* 7, in contact with the studs extending from the cogged wheel *o* 7, thus attaching the shaft *m* 5, to the cogged wheel *o* 7, which otherwise revolves on the shaft. The lever *l* 7, turns on a fulcrum attached to the post *a*, and has a projection in its centre playing in a groove in the clutch *n* 7: *p* 7, is a cogged wheel attached to the pulley *l* 5, and takes into another cogged wheel *q* 7, attached to the end of the shaft *r* 7: attached to the opposite end of the shaft *r* 7, fig. 7, is another cogged wheel *s* 7, which takes into a small cogged pinion *t* 7, which pinion takes into the cogged wheel *o* 7, and turns it in a direction opposite to the motion of the cogged wheel *p* 7. This plan is adopted to produce a reversed motion in preference to using bevil gears in order to reduce the velocity of the reversed motion.

From the above, it will be seen that when the gear *o* 7, is connected with the shaft *m* 5, by the clutch *n* 7, a reversed motion is communicated to the cylinders. The peculiar object of turning back the cylinders is, to reverse the position of the dogs against the clicks playing in slots in the circular plates between the cylinders, in order that the first cylinder put in motion, when it is again employed to move the hooks, may perform an entire revolution before it communicates motion to the second; and that the second may also complete a revolution before it moves the third, and so on through any number of cylinders employed: therefore, it is evident that the last of the series of cylinders does not require to be turned back.

The next portion of machinery to be described, is that which withdraws the clutch *n* 7, from the cogged wheel *o* 7, and destroys the connexion between the shaft *m* 5, and the cogged wheel *o* 7; *u* 7, is a cam attached to the shaft of the cylinder next the last of the series of cylinders; *v* 7, is a pitman, sliding in a bearing *w* 7: one end of this pitman is presented to the cam *u* 7, the reverse end being connected with two toggles *x* 7, *y* 7; the end of the toggle *x* 7, is jointed to a stand attached to the framework; the end of the toggle *y* 7, is jointed to the end of a long rod *z* 7, sliding in stands *a* 8, *b* 8; the opposite end of the rod *z* 7, is connected by a joint to the lever *l* 7, fig. 9. Just as the cylinder with which the cam *u* 7, is connected completes its revolution, the cam *u* 7, pushes out the pitman, thus straightens the toggles, and slides the rod *z* 7, lengthwise:

the rod *z* 7, moves the lever *l* 7, which withdraws the clutch *n* 7, from the studs of the cogged wheel *o* 7: when the lever *l* 7, is moved sideways, as above described, the spring *c* 8, draws the lever *k* 7, inward, and thus brings the end of it to abut against the extremity of the lever *l* 7, and prevents the return of the clutch *n* 7, against the studs of the cogged wheel *o* 7.

The mode of operating the loom is as follows:—The weaver mounts the platform in the middle of the loom, and grasps the top shell of the lay at the handle *o*', with his left hand, and the handle *f*', with his right hand: when thus stationed, he opens the warp to receive the shuttle by the action of his feet upon the treadles *l*, *l*, throws the shuttle with his right hand, and moves the lay and shifts the shuttles with his left hand, in a manner similar to common weaving. When he has inserted the number of threads of woof to be introduced between those to be raised, he lodges the shuttle containing the coarse woof in the shuttle box at the right hand of the lay; or, in other words, at the end of the lay opposite to that at which the hooks or moveable dents begin to act on the filling, and continues to press on the harness treadle with his foot, to secure a large opening between the threads of the warp.

When the first division of the loom is in this stage of its operation, the weaver grasps the ball *h*'' with his right hand, and forms a connexion between the driving pulley and the machinery which regulates the variation in the pattern or figure, adjusts the springs and stop bar, and raises the hooks, and prepares the woof to be acted on by them. Just as this operation is completed, he moves forward the lay until it strikes against the projections *b* 5, *b* 5, to bring the hooks over the woof; he then grasps the ball *p*'', and communicates motion to the cylinder which sinks the hooks. Immediately after this operation is completed, he crosses the warp with his left foot to secure the knots, and with his right foot presses on the treadle *v* 6, to raise the hooks from them. After he moves back the lay to carry the hooks away from the knots, he removes his foot from the treadle *v* 6, and allows them to return to their former position; then he proceeds to operate the first part of the loom as before.

Having described my improvements in machinery to weave knotted counterpanes, and such other figured fabrics where the woof is raised, as may be woven by the said machinery, and shown by the accompanying drawings and foregoing description, the best mode of constructing and adapting the same with which I am acquainted, I desire to be understood that I do not intend to confine myself to the particular form, materials, and arrangement of the parts shown in the drawing, by which I effect my improvements in weaving, as different forms and arrangements of mechanism may be found capable of effecting the same object: and although I have hereinabove described many parts of machinery in common use, as applied in connexion with my improvements and inventions for raising the knots or figures from the surface of the cloth, yet I only claim the combination of such parts with, and their application to, my improvements.

Separately and singly I claim as my inventions and improvements as follows:—First, raising the knots which compose the figure from the surface of the cloth by a series of moveable dents, or teeth, or hooks; second, supporting the woof during the operation of the moveable dents, or teeth, or hooks, and thereby regulating the length of the knots by a bar, beam, or race piece, as hereinabove described; third, separating or dividing asunder the threads of the warp by means of bevilled pieces of metal on the sides of the moveable dents, or hooks, or teeth, to prevent them from catching into and breaking the threads; fourth, a toothed cylinder or cylinders, acting on machinery intervening between them and the dents, or teeth, or hooks, and operating the dents, or teeth, or hooks successively, to raise the knots which compose the figure; fifth, the application of a prism and pattern card to regulate the operation of the hooks, or teeth, or dents, to produce the variations in the pattern or figure.—[*Inrolled in the Rolls Chapel Office, October,* 1837.]

To CHARLES WYE WILLIAMS, *of Liverpool, in the county of Lancaster, gentleman, for his invention of certain improvements in the means of preparing the vegetable material of peat moss or bog, so as to render it applicable to several useful purposes, and particularly for fuel.*—[Sealed 11th November, 1837.]

THIS invention consists, firstly, in a novel or peculiar mode or method, not hitherto adopted or practised, for pressing the water or aqueous parts out of peat moss or bog earth; secondly, in the mixing or incorporating the peat moss or bog earth with the following ingredients, namely, sand finely powdered, or ground limestone, powdered or ground coal, slack, or quick, or hot lime; but I do not confine myself to any particular quantity or proportion of these ingredients separately or together, the quantities being varied according to the quality of the peat moss or bog earth, or to the use to which it is to be applied; and thirdly, in a mode of breaking asunder or destroying the vegetable formations and fibrous texture of the peat bog by the use of a peculiar description of iron cylinders or rollers, as hereafter described.

And in order to give the best information for carrying my invention into effect, I give the following description of the process and means I employ; namely, I subject the peat moss or bog earth to a great degree of pressure, as hereafter described, either, first, in its natural state as taken out of the bog; or secondly, after it has been reduced to a pulpy state, in the manner commonly used in Ireland in preparing peat moss or bog earth for fuel, or what is generally termed hand turf, by kneading, tramping, cutting, bruising, or mashing the same, for the purpose of breaking asunder, and separating its vegetable fibres, texture, formations, and tenacity; or, thirdly, after it has been bruised or ground by means of the common mortar mill used for mixing sand, water, and lime, or by the use of the cylinders or rollers hereafter described, or any other of the well-known milling or bruising processes. One object I obtain by such bruising, or incorporation, or mixing, being to give to the fuel a greater durability in burning, and a greater power of retaining heat, and by it is prevented from cracking or splitting when dry; and further, that by means of such ingredients, a greater facility is given for the escape of the water when under pressure, any of such ingredients acting as a percolater in aiding the passage or filtration of the water from the interior of the peat to its surfaces.

Further, my invention consists in the use and application of a peculiar description of iron cylinders or rollers mounted on horizontal shafts, after the manner of the rollers of the mortar mill; which rollers or cylinders, the use of which I claim exclusively, being constructed of cylindrical plates of iron perforated with holes, the object and operation of which being to force the peat, as they roll over it, to pass through those holes; and by which operation the vegetable formations and fibrous texture is expeditiously torn asunder, destroyed, or broken, and which is preferable to any of the grinding processes, by heavy rollers like that of the mortar mill. These cylinders or rollers I construct of plates of wrought or cast iron mounted on spokes, or resembling those of a common carriage wheel, and which plates are closely perforated with holes sufficiently large and numerous.

The cylinders I use, and which I prefer, being about four feet diameter, with plates about eight to ten inches broad, and about half an inch thick, the holes being about three quarters of an inch to an inch in diameter, and about one inch asunder, although I do not confine myself or my invention to such sized rollers or cylinders, or to such sized holes or spaces. And, note, that the number of cylinders or rollers may be worked conveniently by horses, in the way of a corn-thrashing mill, or by other power, and may be increased to any number, in proportion to the quantity of peat required to be so bruised or mixed, by increasing the length or number of horizontal shafts on which they turn.

And further, my invention consists in the mode, method, or process of pressing the peat moss or bog earth, by placing the peat moss or bog earth to be pressed between layers of other matter or materials, as hereafter described; which layers or materials I term recipients, and into which (both peat and recipients being under equal pressure) the water is forced from out of the interior of the peat or bog earth, and which is itself thus prevented from escaping with the water, as is usually the case when peat alone is subjected to a high degree of pressure without such recipients, in vessels pierced with holes intended for the escape of the water from its interior or middle parts, the water forcing the finer particles of the peat with it at the edges, or through such holes. These recipients, of which I claim the use and invention, consist of a layer or stratum of any substance capable of receiving water while under pressure, and allowing it to pass through or from it, that is to say, of receiving the water from the extended surface of the peat which is in immediate contact with the surface of the recipients, and passing it out from such recipients. These layers of materials or recipients may be made of a plate or plates, or sheets of tin, iron, or other metal, pierced closely with small holes like a cullender, woven wire-work, coarse hempen or woollen cloth layers of fibrous materials which will allow the water to pass through them; and between each of which pierced plates or layers, though not absolutely essential to the process, a piece of woollen or other cloth may be introduced, or a sprinkling of coarse sand, with or without such cloths: the object in introducing such cloths, or sand, or other such like matter, being to increase the internal spaces or interstices into which the water is received, and thus enlarging its capability of receiving and freely passing the water which it has received from the peat or bog earth.

A simple and cheap recipient may also be made by a layer of sand alone, (coarse sand is best,) and confined in sacking or other cloth; and when more than one layer of peat is required to be pressed at one operation, the peat and sand, or other recipients, to be placed in alternate layers; but I do not mean to confine myself, or my invention, to those peculiar kinds or number of recipients which I have mentioned, but to the uses of other kinds of recipients by which the same object can be effected; namely, the giving a direction to the water in its being pressed out of the peat, so that it has to pass through such recipient, or by means of the same, and by which I effect my purpose of preventing the escape of the pulpy or minute particles of the peat with the water, as has been found to be the case in all expedients hitherto adopted whenever a high degree of pressure is used; and this mode or process of pressure, and the use of the recipients alternating with the peat, has this peculiar advantage over all other modes by which it has been attempted to press the water out of peat, that by it the water may be pressed out of the peat as taken from the bog, and the highest degree of pressure used until the peat is become solid and hard, without the necessity of confining it in cylinders or other vessels, or even in a cloth of any kind; the water preferring to pass away and finding a readier means of escape from the surface of the several layers of peat into the recipients, rather than out at the edges or through any holes left for its escape in the vessels in which it has been usually confined for pressure, so that no inconvenient expansion of the peat will take place under the operation of the pressure, provided the first operation of the pressing be not made too suddenly or rapidly, and during which the great portion of the water escapes. This mode of condensing the peat has also the advantage that, when it is pressed, it is in the best state, condition, and thickness for coking, and thus forming the most valuable description of fuel for all workings of iron and steel, and which is one of the other useful purposes to which my invention is applicable: another of such purposes being the formation or cutting of such peat after or during the pressure, into sizes suitable for being used as bricks or other purposes; and for which purposes the mixing or incorporating the peat with sand or lime, as before mentioned, is useful: the mode I adopt being the placing the peat to be pressed in layers alternately with the recipients, under an hydraulic, screw, or other press.

It should be observed, that the thinner the several layers of peat are, the more rapidly will be the operation of pressing be performed; but I have found the most convenient thickness for such layers to be from three inches to four inches, and so as to form a body, after pressure, of about one inch to one inch and a half thickness.

And, note, where more than two or three layers of peat are pressed at one and the same operation, but which number of layers may be increased as far as the range of the press will admit, it will be advisable, and in case the peat be very soft and pulpy, or after the operation of mashing or pulverising, already alluded to, has been used, it will be necessary to separate each alternate layer of peat and its two recipients by a sheet of plate iron or strong planks, the object being to obtain a uniform thickness in the mass or series of layers to be pressed, and thus to secure an even vertical pressure, and avoid the slipping sideways of the several layers thus piled on each other.

And, whereas, the process of making fuel from peat by mashing, bruising, or mixing with other ingredients, and pressing the same, has been practised before, I make no claim of invention to the said processes; but I specially and exclusively claim as my invention, first, the mixing or combining the peat with the articles I have enumerated, which, when combined and incorporated with the peat, act as a percolater during the process of pressure, and by which the water is as it were filtered, and enabled to escape from the peat with greater ease; and which ingredients also enable the peat, in the act of burning, to retain heat much longer than when prepared in the usual way, and without such ingredients. Secondly, I claim the exclusive use of the mode of pressure I have described by the use or interposition of what I call recipients, namely, that which is described as being placed in alternate layers with the peat of whatever those recipients may be formed, and into which or through which the water is first received, passed, or pressed from the upper and under extended surfaces of the peat, both peat and recipients being at the same time subjected to the same degree of pressure; and by the interposition of which recipients, not only is the escape of the water out of the peat facilitated, but by which the highest degree of pressure, even as high as one thousand tons, may be used without endangering the escape of any portion of the peat itself, as the peat will not pass into or through the recipient, although the water will; and, further, by which I so reduce the bulk of the peat, and condense it into hard blocks or cakes, as to enable it at once to be laid up for use, the operation of the atmosphere being sufficient, in a short time, to remove any remaining moisture, and render it fit for use: and thirdly, I claim the exclusive use and application to the bruising, separating, or breaking the vegetable fibres and texture of the peat bog; of the cylinders or rollers pierced with holes, and through which holes the peat is forced as they roll over the peat, such vegetable fibres and texture being effectually and expeditiously destroyed or separated by the passage of the peat through such holes, and cutting or tearing the same by the edges of such holes. —[*Inrolled in the Rolls Chapel Office, May,* 1838.]

To CHARLES WATT, *of Manchester, in the county of Lancaster, lecturer on chemistry, and* THOMAS RAINFORTH TEBBUTT, *also of Manchester, in the county of Lancaster, merchant, for their invention of certain improvements in the manufacture of the hydrate and carbonate of soda, from the chloride of sodium, applicable to the making of soap, glass, and other useful purposes.*—[Sealed 11th January, 1838.]

THE Patentees describe their invention in the following words:—Our invention or improvements consist in converting chloride of sodium (common salt) into oxide or hydrate of sodium (soda), as well as into carbonate and bicarbonate of soda, by the aid of nitric acid, or the nitrates of lead, chrome, manganese, barytes, lime, &c.; and also in the use and application, in the said process of converting common salt into soda, of pure barytes and protoxide of lead, prepared or manufactured in the peculiar manner, method, or process, hereinafter described; that is to say, in the preparations of baryta and protoxide of lead by disengaging the chlorine of these two bodies, in order to prepare them for repeated operations of converting the chloride of sodium into soda or oxide of sodium; and, as we propose to operate with the various substances above stated, we shall proceed to describe the processes which we prefer, together with the apparatus we employ in the various stages of manipulation, especially as adapted to each particular substance employed.

Firstly, in operating in the above process with nitric acid, we take about one hundred weight of chloride of sodium (common salt), and place it in a closed retort or vessel, composed of earthenware or any other substance which is not readily acted upon by chlorine and nitric acid. A cast-iron retort, forme dlike those used in gas-works, and heated by any convenient means, will answer the purpose; or a chamber, or furnace, or oven, constructed of fire-brick, and properly heated and secured, to prevent the egress of the chlorine except through a pipe of any suitable substance, as clay, iron, &c.; which pipe is used for the purpose of conducting off the chlorine into its receivers, which may be the common Woulfe's apparatus, or such as is commonly used in forming the chlorides. To the above chloride of sodium we put about one-fourth of its weight of nitric acid or nitrous acid in their simple states, or mixed with their equal weight of peroxide of manganese, lead, or chromic acid, the latter being obtained by decomposing the chromate of lead or potassa by sulphuric acid, and removing any uncombined sulphuric acid by a small quantity of nitrate or muriate of baryta. The retort or chamber being properly charged with the chloride and acid, or acid and peroxide, or chromic acid, a gentle heat will be sufficient to liberate the chlorine from the common salt, which will come over in great quantity; the charge of materials being occasionally stirred or agitated by a rake or any suitable instrument. And whenever it is desired to learn the state of the operation, it may be done by taking out a small portion of the material and dissolving it in water, into which is put a few drops of dilute solution of nitrate of silver. If any white precipitate is evident, the process is not complete, and more nitric acid and peroxide of manganese, lead, or chromic acid, must be added, until a sample taken out, and thus dissolved or tested, ceases to give a white precipitate with the nitrate of silver. If any nitric acid is retained in the soda, it may be removed by combining the soda with a little charcoal, heating it to red heat. The nitric acid, used as above stated, may be diluted with as much as three times its quantity of water, but then the operation takes longer time, and is more troublesome to the manufacturer, as the water must be evaporated, and the soda brought to a state of dryness, and, therefore, much more time and fuel are uselessly expended. And further, when dilute nitric acid is used, an iron retort or chamber will not answer, as the acid will act too rapidly upon this material.

Secondly. When operating in the process of decomposing common salt by means of the nitrates of barytes, lead, &c., we use no dilution, and prefer heated retorts, or ovens, and apparatus, such as mentioned in the first of our processes. The proportions used in this process or operation are, about half a hundred weight of nitrate to the one hundred weight of chloride of sodium, united with about one-fourth of the weight of the nitrate of the following agents or materials; viz., of peroxide of lead, red lead, manganese, or chromic acid; the latter prepared as already named. The heat applied to the retorts or ovens in this case, viz., when nitrates are employed, must be increased gradually, and the material or chloride and nitrates must be occasionally stirred, and tested by nitrate of silver as before; and, if the operation is not completed, more of each of the decomposing agents, viz., nitrate and oxide or chromic acid must be continually added, until the test indicates that no chlorine remains in the soda, no white precipitate being formed when nitrate of silver is dropped into the solution. The chloride of sodium being now perfectly decomposed, the soda is to be taken out of the retort or chamber, and cleared of all extraneous matters, by dissolving it in water; the oxides of lead, manganese, &c., will easily separate and subside when the soda is dissolved, but the chromic acid will combine with the soda, from which it may easily be removed by slacked lime or pure barytes added until the liquid becomes quite colourless, which liquid is caustic soda in solution, which may be evaporated to dryness. Or the soda may be converted into a carbonate or bicarbonate, by passing into or through it a stream of carbonic acid gas, in the manner commonly used in converting acetate of lead into carbonate of lead; or atmospheric air may be used, which contains carbonic acid. The fact of soda being converted into carbonate or bicarbonate, is known by its effervescing with acids, and losing its caustic taste.

Our next process is as follows:—We put one hundred weight of chloride of sodium into a vessel of iron, or wood, or other suitable materials, and heat the same by fire or steam; we then add water to dissolve the salt, or it may be dissolved before placing in the vessel. The solution is then made to boil, and, when boiling, we put in about an equal weight of protoxide of lead, or hydrated protoxide of lead (if finely levigated, the better), and boil it with the solution until all the chlorine is removed from the salt: this is ascertained by testing it with nitrate of silver, as in the former processes. If any white precipitate is formed, more oxide of lead is to be boiled with the solution until no white precipitate is formed with the nitrate of silver. When this is the case, the liquid soda, which is now perfectly caustic, may be removed, and the water evaporated, and the soda dried or carbonated, as already named in the former process.

Our fourth, or next process, is the following:—We put one hundred weight of chloride of sodium in a vessel, as named in the process when operating with protoxide of lead, and add water to dissolve the salt; we then take pure barytes, in quantity about two-thirds of the weight of the chloride of sodium, and continually stir or agitate the same until the salt has lost its chlorine, adding more barytes if any chlorine is evident on using the test already described. But, as by this process we have chloride of barium with the pure soda, it is necessary to allow the materials to subside, when the chloride of barium settles down as a white powder or precipitate, while the pure soda remains in solution. This solution of caustic soda may be removed from the precipitate, and evaporated to dryness, or combined with carbonic acid, as before described.

And further, we reproduce or form our protoxide of lead used in the said processes of converting common salt into soda, in a very convenient and economical manner, from the chloride of lead (obtained by the common process), by boiling the protoxide or hydrate of protoxide of lead in chloride of sodium; or we form direct a chloride of lead in the following manner; that is to say, we obtain a chloride of lead by putting nitro-muriatic acid (in the proportion of one part of nitric acid to two parts of muriatic) into finely granulated metallic lead, and applying a gentle heat thereto, continuing the process, and adding this compound acid as long as any metallic lead remains. The chloride thus formed, as well as that above named, we decompose, by putting them, mixed with one-third of their weight of deutoxide of lead, and about the same quantity of good sulphuric acid, and adding these agents, and continuing the process as long any chlorine escapes. A retort with Woulfe's apparatus will effect the purpose. We then remove the sulphate of lead thus formed, and place it in a wooden or other vessel, and add sufficient water thereto to cover it; we then remove the sulphuric acid therefrom, by combining it with alumine or magnesia; which earths form soluble salts with sulphuric acid, and which salts we remove by ablution with water. The lead is now what is termed a white hydrate. This hydrate of protoxide is boiled again in fresh chloride of sodium, will again become a chloride, leaving the soda pure and fit for use, thus re-obtaining the protoxide over and over again through a number of operations.

And, lastly, we prepare or reproduce pure barytes, used in the said process of converting common salt into soda, from the chloride obtained by mixing or boiling it with chloride of sodium, to render the latter free from chlorine. The chloride of barium thus formed we again boil with water, in a vessel containing protoxide of lead, about equal in quantity to the barytes originally used, and continue the boiling, and adding protoxide of lead, until the barytes, when tested with nitrate of silver, ceases to give any white precipitate, and the lead is converted into a chloride; we then deprive the lead of its chlorine, as before described, that is to say, we put the chloride of lead with one-third of its weight of red lead or peroxide of lead, and the same quantity of sulphuric acid, into an iron or other vessel having a neck of earthenware, and connected with a suitable apparatus for making the chlorides; and we continue the operation, adding more acid, until the process is completed. We prepare our peroxide of lead used in the said process, by allowing the chlorine (formed by the decomposition of the chloride of lead, obtained by boiling the protoxide with chloride of sodium or barium, which process has been already sufficiently described,) to pass into the protoxide or deutoxide of lead, instead of passing off into a Woulfe's apparatus, or being used for the production of chlorides as in common. By this means, and by thus forming or re-obtaining the various compounds employed, we are enabled to work up all the substances used in the various operations, which occasions much saving; and, by transferring the chlorine to the lead, and the ease of decomposing it again, much less fuel is used than in common, as little or no heat is required to disengage it.

Having now described and ascertained our said improvements, we wish it to be understood that we do not claim our invention or improvements in the said processes of converting common salt into soda, the use of the oxide of lead or pure barytes as usually formed or obtained for depriving chloride of sodium or chlorine, nor any particular apparatus used in the above processes or operations; but we claim the use of nitric acid singly, and combined with the oxides of lead, &c., and also the nitrates, particularly as combined with the peroxides of lead, manganese, and chromic acid.

We also claim, in the said process of converting common salt into soda, the use of pure barytes, prepared, as above stated, by the novel process of boiling the chloride in protoxide of lead, by which means the barytes can be used over and over again, for a number of times, for the same purpose, and the chloride of lead again converted into protoxide and peroxide.

We also claim, in the said processes, the production of protoxide of lead, by saturating the sulphate of lead (formed by the decomposition of the chloride) with alumine and magnesia, for use and application to the above purposes herein stated.

We likewise claim, in the above processes, the use of peroxide of lead, manganese, and chromic acid, used as described in the various parts of this our specification.—[*Inrolled in the Rolls Chapel Office, July*, 1838.]

Specification drawn by Messrs. Newton and Berry.

To JOSEPH JEPSON ODDY TAYLOR, *of Gracechurch-street, in the city of London, mechanist, for his invention of an improved mode of propelling ships and other vessels on water.*—[Sealed 1st May, 1838.]

MY invention of an improved mode of propelling ships and other vessels on water, consists in the use and application of two geometrically-formed blades or propellers, placed or set at an angle on an axis or shaft, which axis is to receive rotary motion in the manner hereinafter described, from a steam engine or other motive power; and, as the axis is turned either one way or the other, the vessel will be propelled ahead or astern. The axis or shaft coincides with the line of the keel of the vessel, and passes through a stuffing box situated in an aperture or opening made under the buttocks, in the stern post, or at the fore side of the stern post, in what is commonly called the "run" of the vessel (or what is sometimes termed the "dead wood" of the vessel), so as to obtain security to the propelling blades, in the event of the vessel grounding or having to contend with heavy seas. And, as the velocity or speed of the vessel by this mode of propelling depends, in a great measure, upon the angle and form of the blades, I have found, by experiment, that the angle of twenty-two degrees to the axis of the propelling shaft is the most efficient, and, therefore, the one which I recommend to be adopted. The form of blade which I have found by experience and repeated trials to be the best, is that which in shape is like unto the blade of an oar; but it must, as a matter of course, vary in length and width, according to the size of the vessel to be propelled; and in order to show more clearly the form of blade I adopt, I refer to the geometrical diagram given in the accompanying drawing, Plate XIV., fig. 1.

My improvements also apply to the shipping and unshipping of the blades or propellers whilst the vessel is afloat, thereby obviating the necessity of going into dock or upon "ways" to remove them from their place of action or to repair, or clear the blades should they be fouled by sea-weed, hawser, or other obstructions; and which consists in having a dove-tailed or other shaped groove formed longitudinally in each stern post on the sides of the opening, in which the blades or propellers revolve, and which for durability and strength should be formed or made of metal; which grooves are to admit and allow the axis of the short shaft to which the two blades or propellers are attached, to be moved up and down. At the bottom of the grooves are the bearings which support the short shaft, and at the end of the short shaft, nearest to the body or hull of the vessel, is formed a square or other shaped recess, to receive a tongue or other coupling formed at the end of the propelling shaft, which shaft passes through, and works in, a proper and secure stuffing-box: this shaft, by being detached from the engine, and pulled or moved inboard, or pushed outwards to the extent of the length of the tongue or coupling, may thereby be readily attached to, or detached from, the propelling blades, the shaft being furnished with a stop to prevent its being drawn further in than necessary, and forms a perfect coupling, which may be used to connect or disconnect the shafts at pleasure. Within the grooves are placed tongue-pieces, which are formed of metal or other materials, and made to slide up and down the grooves: these tongue-pieces have concavities at their end to fit on to the top of the short shaft of the propellers, and at the lower part of each tongue-piece is secured a hook, that will not touch the short shaft when it is revolving on its bearings, which are fixed at the bottom of the grooves, but only when the tongue-pieces are drawn up the grooves by the means of the screw purchase, hereinafter described, affixed to each tongue, and which screws pass upward inboard. The effect of this arrangement of mechanism is, that as soon as the main or inboard propelling shaft is detached from the engine and drawn inwards, a distance equal to the length of its tongue, the hooks will, as the tongues are screwed upwards, come in contact with the under surface of the short shaft, and act as a sling or support, and gradually raise it, and the propelling blades attached thereto, to the surface of the water; and by an opening left in the upper part of the dove-tailed grooves, above the load or water line of the vessel, the short shaft and blades can be taken out into a boat, either on the larboard or starboard side; or, if thought desirable, they may be removed by opening a hatchway formed over the short shaft and blades, they being screwed up, by the above described arrangement, into the hold of the vessel, either to repair, unfoul, or be removed out of the way, should it be desired to sail under canvass only.

Having now stated the nature and object of my invention, I will proceed to describe and ascertain more particularly the manner or method of carrying the same into effect, reference being had to the accompanying drawings, which will serve to illustrate the arrangement of the parts, and a method of constructing and adapting the blades or propellers to the purpose of propelling vessels, the same letters of reference being marked upon corresponding parts in all the figures.

Plate XIV., fig. 1, is a geometrical diagram, showing the form of the blades or propellers; fig. 2, is a side representation of the aft part or stern of a vessel, some portions of which being removed, in order to show the improved mechanism; and fig. 3, is a sectional end view of the stern-post with the propellers attached: *a, a,* is the main rotary or propelling shaft, passing from the engine or first mover through the stuffing-box *b, b,* placed securely in the stern-post at *c,* and having proper glands or means of tightening up the packing as required. Upon the outer end of the propelling shaft is formed the tongue or clutch-piece *d,* shown by dots in fig. 2, which takes into a corresponding clutch-piece at one end of the short shaft *e,* upon which the propellers or blades *f, f,* are mounted. The propellers are situated and revolve in an open space *g, g, g, g,* formed in the buttocks or "run" of the vessel, their axle, when in the working position, turning in the half brasses or bearings at *h, h,* which rest upon the ends of the grooves *i, i,* formed in the sides of the fore and aft stern-posts *h,* and *l.* Within the grooves *i, i,* are placed the pieces *m, m,* attached by proper couplings to the screws *n, n,* which turn in female screws *o, o,* fixed at the upper end; and when the pieces *m, m,* are lowered down upon the ends of the shaft *e,* they form the upper half of its plummer boxes or bearings, which pieces are secured by their being pressed upon the shaft by the screws *n*, *n*. When it is desired to unship the propellers, or raise them out of the propelling position, the propelling shaft *a*, is to be disconnected from the engine, and drawn inward a short distance, so as to withdraw its clutch-piece or tongue at *d*, from out of the clutch of the shaft *e*; this shaft is then free to be raised up by means of the screws *n*, *n*. The hooks or sling pieces, before mentioned, of the pieces *m*, *m*, then take hold of and support the shaft as it is raised; the screws *n*, *n*, being turned by winch handles, levers, toothed gear, or other convenient means, and as soon as the propellers and shaft have been raised up a sufficient height, they may be removed from the vessel by lifting them out of the pieces *h*, *h*, and carried away in a boat: this may be done either on the larboard or starboard side of the vessel, or, if thought more desirable, a hatchway, as seen at *p*, may be made below the stern cabin, and they may be lifted or screwed up through the opening directly into the vessel, and so unshipped.

On again applying the propellers, it is only necessary to again place the shaft with the propellers into the hooks or slings of the pieces *m*, *m*, and lower them by means of the screws *n*, *n*, into their proper propelling position: when this is done, the propelling shaft *a*, is to be moved outward, so that its clutch at *d*, shall take into gear with the shaft *e*; and then, by attaching the shaft *a*, to the rotary mover of the engine, the propellers will be set in motion as before stated, the pieces *m*, *m*, pressing slightly upon the upper side of the shaft *e*, to keep it in its proper position.

Having now described the nature of my invention, and the manner of carrying the same into effect, I shall refer to the geometrical diagram, fig. 1, of the accompanying drawings, which shows the form of my improved blades or propellers, and the proportions which I prefer.

Let A, B, be the required length or radius of the blade; C, D, its breadth equal to about half its length, with the central part reduced in width to a quarter of that of C, D, or half, if greater strength be needful. These blades are placed securely upon the shaft *e*, at about the angle of twenty-two degrees, to its axis, and are formed as a portion of a circle on the outer edge, bevilled off at all the sides.—[*Inrolled in the Rolls Chapel Office, November,* 1838.]

Specification drawn by Messrs. Newton and Berry.

To MILES BERRY, *of the Office for Patents,* 66, *Chancery-lane, in the parish of St. Andrew, Holborn, and county of Middlesex, patent-agent and mechanical draftsman, for an invention of a certain improvement or certain improvements in obtaining motive power for propelling or working machinery, being a communication from a foreigner residing abroad.*—[Sealed 6th June, 1837.]

THIS invention is a peculiar mode of obtaining a rotary motive power from the known force of attraction and repulsion exerted by the dissimilar poles of magnets, either by such as are commonly called "permanent magnets," consisting of magnetized steel bars, or those obtained by electro-magnetism, as iron magnetized by means of a galvanic battery. The electro-magnets are mounted upon a vertical shaft turning in suitable bearings, and are set in rotatory motion by the before-mentioned force of attraction and repulsion exerted by the poles of other magnets, which are made stationary, and placed near to them, for the purpose of acting in conjunction with the rotatory magnet. The shaft of the electro-magnetic bars being thus kept revolving at a great velocity, acquires a motive power capable of turning or setting in rotatory motion other shafts or machinery by means of toothed gear or rigger bands, and which power or force is intended to be used for actuating machinery in general as a motive power or first mover.

Plate XV., fig. 1, is a side elevation of a model apparatus or machine, which will fully serve to explain and illustrate this invention; fig. 2, is a plan or top view, and fig. 3, is a vertical section of the same; and fig. 4, is a horizontal section taken in the line a, b, in fig. 1. The framework is to be of a size and strength adapted for the purpose intended, and may be made of a circular or any other convenient form, divided into two or more platforms or stages B, and C, upon which the apparatus is mounted. The galvanic battery D, is constructed by placing any conveniently shaped plates of copper and zinc E, and F, alternately in a vessel G, containing diluted acid, after the usual manner of forming galvanic batteries. From each vessel or galvanic battery proceed two conductors H, and I; one from the copper plates, and the other from the zinc plates. These conductors H, and I, lead to, and are in contact with, the copper plates K, and L, placed upon the lower platform C. These plates K, and L, act as conductors, and are made in the form of a segment of a circle, and correspond in number and position with the "artificial" or "permanent magnets" S, T, hereinafter described. The plates K, L, are placed around the shaft R, detached from one another, and from the shaft, as seen best in fig. 4. The conductor H, leads from the copper plate of the galvanic battery to one of the said plates, say K; and the other conductor I, leads from the zinc plate of the battery to the other plate L, and so on alternately, if there be more than two plates placed on the lower platform around the shaft.

The galvanic magnets M, N, O, P, are constructed of arms or pieces of soft iron in the shape of a straight bar, horseshoe, or any other convenient figure wound round with copper wire Q, first insulated by means of a non-conducting material placed between the coils. These galvanic arms project in radial lines from the centre of the vertical shaft R, turning on a point or pivot, and resting in a cup *a*, on the lower platform, and in a proper guide or bearing *b*, above the upper platform. The ends *c*, *d*, *e*, *f*, of the copper wire Q, extend from the electro-magnets in parallel lines with the shaft R, down to the copper plates K, and L: these ends *c*, *d*, *e*, *f*, are furnished or tipped with silver, and are in contact with the inner edges of two silver plates *g*, and *h*, within the semicircular plates K, L, as shown in fig. 4. The galvanic magnets are placed upon, and secured to, a horizontal disc of wood V, attached to the shaft R. The artificial, or what are called permanent, magnets S, and T, are made of steel, and in the usual manner of making common or permanent magnets; they may be of any number and degree of strength, and fixed on the upper platform in any convenient manner: those shown in the drawings are segments of a circle of nearly the same diameter as the inside of the platform; or if galvanic magnets are used (which may be done), they may be made in the form of a crescent or horse-shoe, or any other convenient figure, with their poles pointing to the shaft. Having properly arranged these artificial or "permanent" magnets on the top of the upper platform, there will be a corresponding number of magnetic poles, the north being marked No. 5, and the south No. 6. Now, we will suppose the machine to be in a quiescent state, the galvanic or "chargeable" magnet No. 1, being opposite the north pole of the artificial or "permanent" magnets No. 5, the galvanic or "changeable" magnet No. 3, will, of course, be opposite the south pole No. 6, of the permanent magnets, and the other galvanic magnets Nos. 2, and 4, will be at points opposite each other between the poles just mentioned.

From the circumstance of there being a corresponding number of conductors *c, d, e, f,* of the ends of the copper wire, which are placed around the shaft R, below the artificial magnets M, N, O, P, but detached from the shaft, as well as from each other; and further, from these wires or conductors leading from the galvanic magnets to the plates K, L, and being in contact with them, as before described, the conductors *c, d, e, f,* will stand in the same position in relation to the copper plates, that the galvanic magnets stand relative to the artificial or permanent magnets; but with this difference, that the conductors *c, d, e, f,* are in contact with the plates K, L, whereas the magnets are not in contact with each other.

Now, in order to put the machine in motion, the galvanic magnets Nos. 2, and 4, being charged by the galvanic current passing through the various conductors and plates above described, from the copper plates (or positive side) of the galvanic battery along the conducting wires, or whatever material is employed to the zinc plate (or negative side) of the same battery. The galvanic current passing around the galvanic magnet Nos. 2, and 4, produces magnetism therein, with a north and south polarity; No. 2, having north, and No. 4, south polarity; of course the south pole of the artificial magnet No. 6, will attract the north pole of the galvanic magnet No. 2, and will move it a quarter of a revolution, (see the diagram fig. 5, which is drawn the better to illustrate this operation,) the south pole of the galvanic magnet No. 4, being at the same time attracted by the north pole No. 5, causes the magnet No. 4, also to perform a quarter of a revolution, the momentum of the galvanic arms or magnets will carry them past the space between the poles Nos. 5, and 6; at which time the several conductors *c, d, e, f,* on the ends of the coiled wires of the galvanic magnets, will have changed their positions relatively to the plates K, and L, and also, consequently, in relation to the positive and negative sides of the battery, causing the "galvanic current" to flow in a different direction around the galvanic magnets, thereby changing the poles Nos. 2, and 4; No. 2, now having south, and No. 4, north polarity, the parts of the galvanic magnets are, of course, now repelled by the poles that before attracted them, and in this manner the operation is continued, producing a rotary motion to the shaft R, which motion may be communicated to any machinery for the purpose of propelling the same.

The discovery here claimed and desired to be secured by the above-recited Letters Patent, consists in applying the force obtained by magnetism and electro-magnetism as a power for moving or actuating machinery in the manner above described, or in any other modification which is substantially the same in principle and effect.—[*Inrolled in the Rolls Chapel Office, December,* 1837.]

Specification drawn by Messrs. Newton and Berry.

To WILLIAM WELLS, *of Manchester, in the county of Lancaster, machine-maker, and* SAMUEL ECCLES, *of the same place, mechanic, for their invention of certain improvements in power looms and in hand looms for weaving plain and figured fabrics.*—[Sealed 5th January, 1838.]

PLATE XV., fig. 1, is a front view of the loom, with the Jacquard in section; fig. 2, a side view of the loom. N.B. The same marks of reference lead to the same parts in each view of the drawings: A, the cast iron framework of a common power loom, such as are in use for weaving light fabrics; B, the first motion crank shaft and crank wheel; C, the tappet shaft; D, the lay; E, the Jacquard or mounting; F, beams fixed in the building (or they may be attached to the loom) for the purpose of supporting the Jacquard; G, the grife or knife board of the Jacquard; H, the comber board; I, the lingers or leads; K, the strap and spring lever, which puts the loom in and out of motion; L, the taking up motion, cloth beam, &c.

Be it understood that the Jacquard and the ordinary methods of making the above machinery forms no part of our invention; but we have here shown them in order to enable us to explain the various mechanical arrangements hereafter described, which forms the principle of our improvements, that is to say, *a*, is a stud placed in the arm of the crank wheel B; M, an adjustable connecting rod rising to the main lever N: the centre of the lever N, is at B; the short end of the said lever has two arms, which take hold of the rod *c*, at the points 1, and 2, fig. 2: at the same points are also two iron links *d*, the lower ends of these links take hold of the studs *e*, which are fixed in the grife or knife board G, thus causing the said grife or knife board to be raised and depressed alternately at every revolution of the crank shaft B.

In order to compensate for the weight of the knife board and the weight of the lingers or leads, we use what we term the balance weights O; these balance weights are adjustable on the levers P; the said levers hanging loose on studs at *e*, *e*; the cords *f*, are then attached to the ends of the levers P, and passing nearly once round the scrowl or excentric pulleys Q, which are fixed to each end of the tumbling shaft R, are then made fast: two small pulleys *g*, are also placed upon the tumbling shaft R; to these pulleys are fastened two straps *h*, which take hold of the rod *c*, at the points 1, and 2; by these means the balance weights O, are enabled to assist the lever N, in raising the knife board G, and the lingers or leads I.

It will be observed that the said balance weights will operate with an increasing power as the cords *f*, recede from the centre of the tumbling shaft on the excentrics Q, the said cords being close to the centre of the shaft, as seen by the dotted lines at 3, fig. 4, when the warp and leads are at rest. Another advantage gained by the balance weights is, their acting with the extreme of their power at the same instant of time at which the shuttle is thrown, consequently distributing the power (required to propel the loom) in the most beneficial manner. N.B. There are various modes of lifting the grife, which might be here explained, but we consider that the one described is sufficient to show the operation of our improved method of balancing the said grife and the lingers or leads.

The second part of our invention consists in the following method of stopping the loom when the shoot or weft breaks, and when the bobbin is empty, that is to say, *i*, is a small excentric or cam fixed on the tappet shaft *c*; *k*, is a lever, on which the said excentric operates; to the long end of the lever *k*, is made fast the small strap *l*, one end of which proceeds upwards and over the pulley *m*, and the other downwards and under the pulley at *n*, forming, as it were, an endless line; but the strap being cut away at 4, and 5, fig. 1, a number of strong threads, (say 5, or 6,) are there introduced and tied to the ends of the straps, still forming an endless line: the said threads have eyelet holes or mailes *o*, which operate in a similar manner to healds; through the said healds are passed a small warp consisting of about ten threads, i. e., five threads up and five threads down when opened as at *p*, *q*, fig. 2: this we call the detecting warp; the detecting warp is then made fast to the breast beam, passed through the end of the reed, through the mailes or healds, and over the small pulley *r*; the weight *s*, is then suspended to the end of the warp in order to keep it at the required tension. Two small brass levers *t, u,* are balanced in a delicate manner on the side of the loom at 6, the long end of the lever *t,* is tied to the upper part of the detecting warp by a corresponding number of small loose threads *v*; the short end of the lever *t,* is connected to the lever *u,* by a small wire. The curved end of the lever *u,* has a steel stud *w,* fixed in it; the other end of the said lever is weighted merely to balance itself: *x,* is a stopping plate, fixed by a set screw on the strap or spring lever K, which, when the loom is in operation, stands directly opposite the small plate screwed to the front of the lay *y*. The operation of the above is as follows; namely, the moment the shuttle has entered the box where the detecting warp is placed, the said warp *p, q,* endeavour to cross each other, but cannot do so because of the weft thread being between them; consequently the stopping levers *t, u,* not being at all acted upon, remain stationary, the stud *w,* continuing to enter the cavity in the front of the lay at every stroke made by the lay. But when there is no weft in the shed the detecting warp threads immediately cross and change places with each other, the upper threads pulling along with them the end of the lever 2, causing the stud *w,* to become depressed, as shown by dotted lines fig. 3, and brought in between the plate *y,* in front of the lay, and the stopping plate *x,* on the strap lever, by which means the strap lever is dislodged by the force of the lay, and consequently the loom stops.

The third part of our invention consists in disengaging the taking up weight from the cloth beam by the stopping of the loom. This is accomplished by means of a rod *z,* which is fixed at one end to the strap lever K, and passing across the loom, takes hold of the spring 7, by a hole in the end of the rod; one end of the string is made fast to the loom side, and the other to the catch 8. It will be easily perceived that when the strap lever is in the direction of the dotted line, the catch will be allowed to rest upon the catch wheel L, and consequently in action; but when the strap is dislodged, the catch 8, will be lifted from off the wheel, and the weight thrown out of action.

These our improvements are applicable to all looms worked by either hand or power, for the purpose of weaving plain and figured fabrics.—[*Inrolled in the Inrolment Office, July,* 1838.]

Specification drawn by the Patentees.

To WILLIAM SOUTHAM, *of Ditchford-mills, in the parish of Irchester, in the county of Northampton, miller, for his invention of an improved apparatus or machine for drying corn and other grain, and seeds.*—[Sealed 11th January, 1838.]

THIS invention of an improved apparatus or machine for drying corn, grain, or seeds, consists in a peculiar arrangement of mechanical parts constituting an apparatus or machine suited to the performance of such operations, through which apparatus the wet or damp corn, grain, or seeds, are to be passed; and in passing, are submitted to the action of an atmosphere of heated air for the purpose of driving off, by evaporation, the damp and moisture contained in such corn, grain, or seeds.

The apparatus is shown in several figures in Plate XV., the respective parts of which are marked by certain letters of reference, the same letters pointing out corresponding parts in all the figures.

Fig. 1, represents an external elevation of the apparatus or machine as seen on the side; fig. 2, is a front end elevation of the same; fig. 3, is a vertical section taken longitudinally through the complete apparatus; and fig. 4, is also a vertical section, taken transversely through the outer casing or box and brickwork. The operating parts of the drying apparatus are enclosed in an iron box *a, a, a, a,* which is erected upon a brick or stone-work foundation *b, b, b,* having a furnace *c,* and flues *d, d,* extending under and around the box *a,* in any convenient and proper manner to communicate heat to the same, and passing off to a proper chimney or shaft; which furnace, when charged with fuel in a state of combustion, causes the atmospheric air in the box or chamber *a,* to become considerably heated. The damp or wet corn, grain, or seeds to be dried, are passed from an upper floor or hopper in the mill, or other building where the apparatus may be situated, into the small regulating hopper or receiver of the apparatus *e,* which is furnished with a sliding shutter or door, and aperture *f,* for the purpose of regulating the supply of damp corn, grain, or seeds, to the drying chamber, and consequently the flow of the same through the apparatus. This regulator, shutter, or door is adjusted by means of the lever *g,* to which it is attached, and the adjustable thumb-screw *h,* bearing against a fixed stay or standard. The damp or wet grain or seeds fall from the apertures of the receiving hopper *e,* through the mouth or opening *i,* of the vibratory drying chamber *k,* formed of sheet metal, or of metal or other framework, and woven wire fabric or gauze, if desired; but if the bottom of the drying chamber is formed of wirework, then it will be desirable to place an iron plate between it and the bottom of the box *a,* in order to receive the dust or extraneous matter which may sift through the wirework, and if allowed to fall upon the bottom of the box *a,* might be scorched or ignite, and thereby produce disagreeable effects. The corn or seeds flow through the drying box or chamber *k,* which is placed in an inclined position to facilitate its progress, and is delivered from the chamber at the mouth of the small transverse trough *l*, into the inclined conducting off pipe or channel *m*, from whence it falls on to the floor of the room, and is immediately spread thinly thereon in order to allow it to give off the steam or vapour, and to cool: but what I prefer most is, for the corn to be passed from the apparatus on to a wire-gauze inclined frame or cooler; in passing over the surface of which, free access of cold air is allowed to the corn, and thus the vapour or steam arising therefrom is carried off, and the corn completely cooled.

In order to facilitate the process of drying, and the passage of the corn through the apparatus, the drying box or chamber *k*, has a vibratory or shogging motion given to it, which keeps the corn continually agitated as it passes down the drying chamber. This is effected by means of the rotatory winch handle *n*, upon the shaft *o*, to be turned by manual labour, the shaft turning in suitable bearings on side brackets; or the shaft may be turned by a band passed from any convenient rotatory motion in the mill to a rigger. Upon this shaft *o*, is formed the small crank *p*, to which is connected the rod *q*, jointed at its other end to the bent lever *r*, which has its fulcrum at *s*; the other arm of this lever, marked *t*, see fig. 4, is passed through an eye or staple on the side of the drying chamber, and forces it on one side and draws it backward as the crank goes round, thereby giving it a lateral shogging motion. The drying chamber is suspended within the box or casing *a*, by means of the rods or chains *u*, *u*, at its lower end, and by the other chains *v*, *v*, at its upper end, which are connected with two pulley wheels or riggers *w*, *w*, mounted upon a shaft turning in proper standards. Upon the axle of these riggers is placed the arm or lever *x*, connected to the rod *y*, which is furnished with an adjustable screw and nut *z*, bearing upon a fixed piece or bracket, and by which means the inclination of the drying box or chamber *k*, may be adjusted to any desired inclination, and consequently the flow of the grain or seeds through the same may be facilitated or retarded. And I would here remark, that the drying box or chamber *k*, may be made with or without a moveable lid, and also that the top of the outer case or box *a*, may also be made moveable if desired; and further, that the outer case or chamber may be constructed with the top and bottom only of iron, and the sides of brickwork, or the bottom may also be made of fire-brick, if thought desirable: all of which variations will be easily suggested by any practical engineer or workman, without departing from my improved apparatus or machine.—[*Inrolled in the Rolls Chapel Office, July*, 1838.]

Specification drawn by Messrs. Newton and Berry.

To JOHN CONSITT, *of Manchester, in the county of Lancaster, machinist, for his invention of certain improvements in the machinery used for spinning, doubling, and twisting cotton and other fibrous substances.*—[Sealed 8th March, 1837.]

MY improvements in the machinery used for spinning, doubling, and twisting cotton and other fibrous substances, are designed principally to facilitate the processes of preparing and spinning cotton, and, at the same time, to effect an improvement in the yarn or thread produced; that is, to cause the same to be more regular, even, and compact, and, by keeping the fibres of the cotton straight and level, to work them more effectually into the body of the thread or yarn, instead of leaving the fibres of the threads loose and rough, as ordinary spinning machines are liable to do.

The manner in which I propose to effect my improvements in spinning, is, chiefly by altering the usual speeds at which certain parts of common spinning machinery work, and by driving all the preparation machines (in which two or more series of drawing rollers are used), by means of a much slacker strap than is commonly employed, which alone will be found to effect a considerable improvement in the yarn.

Thus in the drawing frame, the roving frame, the jack frame, the stretching frame, and the throstle, I put a driving pulley of a larger diameter than is commonly employed, in order to work all these machines with a slacker strap.

The alterations I propose to make in the mule, particularly in the ordinary hand-mule for spinning fine numbers of yarns, are, to make the driving pulley of larger diameter, in order to pursue the same system of using a slacker strap than common; and also to make a greater difference between the single and double speeds of the mule, so as to work the mule slower in the roving part, or that portion of the spinning which is performed by the rollers and parts connected therewith, and quicker in the "stretching and twisting" processes; the difference I propose is about $1\frac{7}{10}$ to $3\frac{4}{10}$ of the respective diameters of the speed wheels which govern these parts of the mule.

These alterations will be found to make the rollers work much smoother, and keep the cotton from being ruffled in the rollers, and cause it to hang better together; thus keeping the fibres straight and even, so as to work them into the body of the thread with greater facility.

A further alteration I propose to make in mules for spinning fine numbers of cotton or other material, is in those cases where spur or bevil wheels are used to give the "single and double speed," consisting generally of four wheels, two larger and two smaller; I alter two of them, that is, one of the pairs, in order to make a greater difference between the single and double speed; but in constructing new mules, I should have two pairs of fast and loose pulleys, one larger and the other smaller, to be driven by two straps, instead of any gearing whatever, so as to obtain the single and double speeds.

And in that part of the process of mule spinning called the "going out" of the carriage which carries the spindles, instead of any toothed wheels, I make use of pulleys and straps, and thus prevent the "back lash" of the wheels: this alteration will be found to keep all "sincks" or curts out of the yarn.—[*Inrolled in the Rolls Chapel Office, September*, 1837.]

Specification drawn by Messrs. Newton and Berry.

ORIGINAL COMMUNICATION.

ON CAOUTCHOUC.

BY ANDREW URE, M.D., F.R.S., &c. &c.

(To the Editor of the London Journal of Arts.)

SIR,—Since writing the article CAOUTCHOUC for my "Dictionary of Arts, Manufactures, and Mines," now in course of publication, I have received, from several quarters, some valuable information; and have also made a series of experiments upon the subject, the results of which I have now the pleasure of transmitting to you for insertion in your journal.

Hitherto the greater part of the caoutchouc has been imported into Europe from South America, and the best from Para; but of late years a considerable quantity has been brought from Java, Penang, Sincapore, and Assam. About twelve months ago, Mr. William Griffith published an interesting report upon the *Ficus-elastica*, the caoutchouc tree of Assam, which he drew up at the request of Captain Jenkins, agent in that country to the Governor-General of India. This remarkable species of fig tree is either solitary, or in twofold or threefold groups. It is larger and more umbrageous than any of the other trees in the extensive forest where it abounds, and may be distinguished from the other trees, at a distance of several miles, by the picturesque appearance produced by its dense, huge, and lofty crown. The main trunk of one was carefully measured, and was found to have a circumference of no less than 74 feet; while the girth of the main trunk, along with the supports immediately round it, was 120 feet. The area covered by the expanded branches had a circumference of 610 feet. The height of the central tree was 100 feet,

It has been estimated, after an accurate survey, that there are 43,240 such noble trees within a length of 30 miles, and breadth of 8 miles of forest near Ferozepoor, in the district of Chárdwár, in Assam.

Lieutenant Veitch has since discovered that the *Ficus-elastica* is equally abundant in the district of Naudwar. Its geographical range in Assam seems to be between 25 deg. 10 min. and 27 deg. 20 min. of north latitude, and between 90 deg. 40 min. and 95 deg. 30 min. of east longitude. It occurs on the slopes of the hills, up to an elevation of probably 22,500 feet. This tree is of the banyan tribe, famed for " its pillared shade, where daughters grow about the mother tree," which has furnished the motto *tot rami, quot arbores,* to the Royal Asiatic Society. Species of this genus afford grateful shade, however, in the tropical regions of America, as well as Asia.

Many species of other trees yield a milky tenacious juice, of which birdlime has been frequently made; as *Artocarpus integrifolia,* and *Lakoocha, Ficus indica* and *religiosa,* also *F. Tsiela, Roxburghii, glomerata,* and *oppositifolia.* From some of these an inferior kind of caoutchouc has been obtained.

The juice of the Ficus-elastica of Chárdwár is better when drawn from the old than from the young trees; and richer in the cold season than in the hot. It is extracted by making incisions a foot apart, across the bark down to the wood, all round the trunk, and also the large branches, up to the very top of the tree; the quantity which exudes increasing with the height of the incision. The bleeding may be safely repeated once every fortnight. The fluid, as fresh drawn, is nearly of the consistence of cream, and pure white. Somewhat more than half a *maund* (42 libs.) is reckoned to be the average produce of each bleeding of one tree; or 20,000 trees will yield about 12,000 maunds of juice; which is composed in 10 parts, of from 4 to 6 parts of water, and, of course, from 6 to 4 parts of caoutchouc. The bleeding should be confined to the cold months, so as not to interfere with, or obstruct the vigorous vegetation of the tree in the hot months.

Mr. Griffith says, that the richest juice is obtained from transverse incisions made into the wood of the larger reflex roots, which are half exposed above ground, and that it proceeds from the bark alone. Beneath the line of incision, the natives of Assam scoop out a hole in the earth, in which they place a leaf of the *Phrynium capitatum*, Lin., rudely folded up into the shape of a cap. He observes that the various species of *Tetranthera*, upon which the *Moonga* silkworm feeds, as also the castor oil plant, which is the chief food of the Eria silkworm, do not afford a milky caoutchouc juice. Hence it would appear that Dr. Royle's notion of caoutchouc forming a necessary ingredient in the food of silkworms, and being "in some way employed in giving tenacity to their silk," seems to be unfounded. If Botany discountenances this idea, Chemistry would seem to scout it altogether, for silk contains 11.33 per cent. of azote, and caoutchouc contains none at all;* being simply a solid hydro-carburet, and, therefore, widely dissimilar in constitution to silk, which consists of oxygen 34.04, azote 11.33, carbon 50.69, and hydrogen 3.94 in 100 parts.

This hydro-carburet emulsion is of common occurrence in the ORDERS *Euphorbiacia* and *Tulicea*, which may be looked on as the main sources of caoutchouc. The American caoutchouc is said to be furnished by the *Siphonia elastica*, or the *Hevea guianensis* of Aublet, a tree which grows in Brazil, and also in Surinam.

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* See my paper on the ultimate analysis of vegetable and animal substances, in the Phil. Trans. for 1822.

Dr. Royle sent models of cylinders, of 1½ to 2½ inches in diameter, and 4 or 5 inches in length, to both the Asiatic and Agricultural Societies of Bengal, to serve as patterns for the natives to mould their caoutchouc by. Mr. Griffith says that this plan of forming the caoutchouc into tumblers or bottles, as recommended by the committee of the London Joint-stock Caoutchouc Company, is, in his opinion, the worst that can possibly be offered; being tedious, laborious, causing the caoutchouc to be blackened in the drying, and not obviating the viscidity of the juice when it is exposed to the sun. He recommends, as a far better mode of treating the juice, to work it up with the hands, to blanch it in water, and then subject it to pressure. I shall presently describe a still better method which has recently occurred to me, in experimenting upon the caoutchouc juice. This fluid, with certain precautions, chiefly exclusion from air, and much warmth, may be kept in the state of a creamy emulsion for a very long time.

NEW EXPERIMENTAL RESEARCHES ON CAOUTCHOUC.

The specific gravity of the best compact *Para* caoutchouc, taken in dilute alcohol, is	0.941567
The specific gravity of the best Assam is	0.942972
,, ,, Sincapore	0.936650
,, ,, Penang	0.919178

In the process of making the ELASTIC TISSUES,* the threads of caoutchouc are first of all deprived of their elasticity, to prepare them for receiving a sheath upon the braiding machine. For this purpose they are stretched by hand, in the act of winding upon the reel, to 7 or 8 times their natural length, and left two or three weeks in that state of tension upon the reels. Thread thus *inelasticated* has a specific gravity of no less than 0.948732; but when it has its elasticity restored, and its length reduced to its pristine state, by rubbing between the warm palms of the hands, the specific gravity of the same piece of thread is reduced to 0.925939. This phenomenon is akin to that exhibited in the process of wire-drawing, where the iron or brass gets condensed, hard, and brittle; while it disengages much heat: which the caoutchouc thread also does in a degree intolerable to unpractised fingers, as I have experienced.

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* See "Dictionary of Arts, Manufactures, and Mines."

Having been favoured by Mr. Sievier, managing director of the Joint stock Caoutchouc Company, and by Mr. Beale, engineer, with two different samples of caoutchouc juice, I have subjected each to chemical examination.

That of Mr. Sievier is greyish brown, that of Mr. Beale is of a milky grey colour; the deviation from whiteness in each case being due to the presence of aloetic matter, which accompanies the caoutchouc in the secretion by the tree. The former is of the consistence of thin cream, has a specific gravity of 1.04125, and yields, by exposure upon a porcelain capsule, in a thin layer, for a few days, or by boiling, for a few minutes, with a little water, 20 per cent. of solid caoutchouc. The latter, though it has the consistence of pretty rich cream, has a specific gravity of only 1.0175. It yields no less than 37 per cent. of white, solid, and very elastic caoutchouc.

It is interesting to observe how readily and compactly the separate little cloths or threads of caoutchouc coalesce into one spongy mass in the progress of the ebullition, particularly if the emulsive mixture be stirred; but the addition of water is necessary to prevent the coagulated caoutchouc from sticking to the sides or bottom of the vessel and becoming burnt. In order to convert the spongy mass thus formed into good caoutchouc, nothing more is requisite than to expose it to moderate pressure between the folds of a towel. By this process the whole of the aloetic extract, and other vegetable matters, which concrete into the substance of the balls and junks of caoutchouc prepared in Assam and Java, and contaminate it, are entirely separated, and an article nearly white and inodorous is obtained. Some of the cakes of American caoutchouc exhale when cut the fœtor of rotten cheese; a smell which adheres to the threads made of it, after every process of purification.

In the interior of many of the balls which come from both the Brazils and East Indies, spots are frequently found of a viscid tarry-looking matter, which, when exposed to the air, act in some manner as a ferment, and decompose the whole mass into a soft substance, which is good for nothing. Were the plan of boiling the fresh juice along with its own bulk of water, or a little more, adopted, a much purer article would be obtained, and with incomparably less trouble and delay, than has been hitherto brought into the market.

I find that neither of the above two samples of caoutchouc juice affords any appearance of coagulum when mixed in any proportions with alcohol of 0.825 specific gravity; and, therefore, I infer that albumen is not a necessary constituent of the juice, as Mr. Faraday inferred from his experiments published in the 21st vol. of the Journal of the Royal Institution.

The odour of Mr. Sievier's sample is slightly acescent, that of Mr. Beale's, which is by far the richer and purer, has no disagreeable smell whatever. The taste of the latter is at first bland and very slight, but eventually very bitter, from the aloetic impression upon the tongue. The taste of the former is bitter from the first, in consequence of the great excess of aloes which it contains. When the brown solution which remains in the capsule, after the caoutchouc has been separated in a spongy state by ebullition, from 100 grains of the richer juice is passed through a filter and evaporated, it leaves 4 grains of concrete aloes.

Both of these emulsive juices mix readily with water, alcohol, and pyroxilic spirit, though they do not become at all clearer; they will not mix with *caoutchoucine* (the distilled spirit of caoutchouc), or with petroleum-naphtha, but remain at the bottom of these liquids as distinct as mercury does from water. Soda caustic lye does not dissolve the juice; nitric acid (double aquafortis) converts it into a red curdy magma. The filtered aloetic liquid is not affected by the nitrates of baryta and silver; it affords with oxalate of ammonia minute traces of lime.

In a continuation of this paper I shall lay before your readers, next month, several interesting facts concerning the manufacture of caoutchouc on the great scale, supplementary to the account given in my Dictionary of Arts, &c.

13, Charlotte-street, Bedford-square, Feb. 18, 1839.

SCIENTIFIC ADJUDICATION.

ROBERTS'S SELF-ACTING MULE.

Before the Judicial Committee of Her Majesty's Privy Council, at Westminster, 22d February, 1839*: present, the Marquis of Lansdowne (president), Lord Lyndhurst, Lord Brougham, and Sir Herbert Jenner.—Counsel, Sir F. Pollock and Mr. Teed.*

On the petition of Richard Roberts, of Manchester, engineer, for an extension of the term of his patents, granted in England 29th March, 1825, and subsequently in Scotland and Ireland, for "his improvements applicable to the mule, Billy, Jenny, stretching frame, or any other machine or machines, however designated or named, used in spinning cotton, wool, or other fibrous substances; and in which either the spindles recede from or approach the rollers or other deliverers of the said fibrous substances, or in which such rollers or deliverers recede from or approach the spindles." (For specification of this patent, see "London Journal of Arts, &c.," First Series, vol. xiii. p. 6.)

No caveat for opposing the application having been entered,

The Attorney-General briefly addressed their lordships, stating that he had no objection to offer to the prayer of the petitioner being granted.

A model of the machine was then introduced, and the nature and object of the invention was explained by one of the foremen in the employ of Messrs. Sharp, Roberts, and Co.

Evidence was heard in support of the allegations in the petition; and after a short consultation, their lordships granted a prolongation of the several patents for the term of seven years, on account of the ingenuity and merit of the invention, and the difficulties opposed to the Patentee in bringing it into effective operation, and consequently not having derived a fair remuneration for so important an invention during the original term of the patents.

Before the same Meeting of the Council.

WRIGHT'S BLEACHING APPARATUS.

COUNSEL, SIR F. POLLOCK.

On the petition of Lemuel Wellman Wright, for an extension of the term of patent, granted in England 20th April, 1825, for his invention of machinery or apparatus for washing, cleansing, or bleaching of linens, cottons, and other fabric goods or fibrous substances.—(For specification of this patent, see vol. ix., First Series, of "The London Journal of Arts," p. 281).

The Attorney-General objected to the extension, on the principle that this invention had not been carried into effective operation. Evidence was called to prove that the apparatus had been in use, but difficulties from adverse partners and from law proceedings, in which the Patentee had been for some years involved, prevented the invention being carried into such effective operation, as to remunerate the Patentee, who has lately become the sole proprietor of the patent.

The advantages likely to result from applying this invention to the bleaching of linen and cotton fabrics in general, and to the yarns in their rough state, as well as for domestic use, was explained by several practical bleachers from Lancashire. The great saving of time by this improved operation—the economy in the consumption of materials, and the perfect manner in which it performed the work with less injury to the goods than the ordinary process having been unequivocally stated by all the witnesses, induced the Council to extend the original patent for a further term of seven years.

SCIENTIFIC NOTICES.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from p. 305.)

May 29, 1838.

The President in the chair.

The minutes of the conversation on the explosion of steam boilers were read, and Mr. Lowe stated that the ordinary process of making water-gas showed that an iron plate would readily decompose steam or water. The decomposition of water goes on extremely well until the oxidation of the tube has advanced to at least three-sixteenths of an inch. An iron tube begins to make gas extremely fast at first, and continues until the tube is cased with a thick crust of protoxide of iron.

The drawings of the shield at the Tunnel were exhibited, and Mr. Brunel explained the construction of the shield, and the manner in which it is advanced and worked.

June 12, 1838.

The President in the chair.

Mr. Bruff exhibited an improved form of levelling staff. The figures on this staff are inverted, so that when viewed by an inverting telescope in the usual manner, they appear erect, and are read off without any danger of mistake; which may readily occur when some figures, as for instance 6 and 9, are read off inverted. The mechanical arrangements for extending it are with the view of securing greater steadiness. The principal improvement consists in there being attached to the bottom an universal joint, fixed to an iron plate; this plate remaining fixed, the necessary errors consequent on moving the staff for reversing its face, when the last forward station is to become the next back, are avoided.

It was suggested that the universal joint would be attended with great advantages in sloping ground; in general, however, the tripod invented by Mr. Simms was sufficiently convenient.

Mr. Bald suggested that the universal joint would be extremely serviceable if placed on something solid. It was his practice to drive a wooden plug into the ground, on which the staff was set; these plugs were left in, and serviceable for verifying the observations. He had levelled through a distance of forty miles, leaving a plug at every station.

Description and Drawing of the Ice-boat. By S. Ballard, A. Inst. C. E.

The principle of breaking ice adopted by Mr. Ballard, as explained in a communication made last session, consists in forcing the ice upwards instead of forcing through it horizontally, or by pressing it down. For this purpose a frame, coated with sheet iron, is laid over the front of a boat, with an inclination downward from the boat, the lower end being under the ice. The paper describes the construction of the boat by reference to a deteiled drawing and section.

Experiments on the Flow of Water through Pipes of different Lengths. By W. A. Provis, M. Inst. C. E.

In this paper are recorded *two hundred and eight* experiments on the flow of water through leaden pipes of 1¼ inch diameter, of lengths 100, 80, 60, and 40 feet, and for heads of water of 35, 30, 24, 18, 12, and 6 inches. The arrangement of the experiments is described with great accuracy, and the results of the experiments are given in twelve tables, showing the length and inclination of the pipe, the head of water at the upper end of the pipe, the time from turning the water into the upper end of the pipe to its reaching the lower end, the time of filling the receiver, the discharge in cubic feet per minute, and the mean discharge per minute. To each set of experiments is appended a column of remarks, in which the state of the pipe as to dryness, and the quantity of water in the discharging end, are recorded; these circumstances having considerable influence on the quantity of the discharge.

The experiments are tabulated in a different form, showing the effect of a given head of water in pipes of different lengths and inclinations. The following important results are deduced. In level pipes the quantity of water discharged is nearly in the inverse ratio of the square root of the length; but the departure from this rule is greatest in the shortest lengths and greatest heads. In inclined pipes, the increased discharge is greater in the long than in the short pipes. The increased discharge for an increased head is nearly in the same proportion through the long and short lengths.

June 19, 1838.

The President in the chair.

On the Construction of Roads on Deep Bogs and Moss.

By W. Bald.

In this paper the author gives a detailed account of the construction of roads through bogs, and of the methods of securing the foundations of small bridges in boggy places; also some suggestions on the formation of railways on deep moss.

The general principles are as follow:—The first operation after laying out the line of road, is to drain thoroughly the bog over which it is to pass. For this purpose main and counter drains parallel to the line of road are to be cut with a regular discharging fall along the bottom. Transverse drains must also be cut betwixt the main and the counter drains, so as effectually to drain off all the surface water and stagnant pools. The cutting of these drains must be carried on gradually, and by degrees; if the bog be moist, the operations, which can only be carried on at dry seasons of the year, will probably have to be continued over three or four years before the drains become permanently fixed at the required dimensions. The counter drains are essential, as they relieve the pressure on the sides of the main drain, and consequently prevent it filling up. The bog stuff cut out is to be dried, and when the bog under the line of road has become sufficiently dry, the road is to be levelled and made of proper shape, and the cross drains are to be filled with dry turf.

The roadway is then to be floored or trunked over with five courses of dry heathy sods, which are to be well rolled with a heavy cylinder. Upon this trunking is to be laid a soling, consisting of a mixed mass of prepared earth and gravel, of about six inches in thickness, and the whole to be coated with good clean gravel. The road metal is then to be laid on, in two successive coats, each of about three inches in thickness, the first being well consolidated before the second is laid on.

The great points to be aimed at are perfect drainage and good trunking, as, if these are not attained, roads constructed on bog will lose their shape, become ruinous, and soon go to decay.

The author considers the form and size of hammers employed in breaking hard stones. These are frequently too heavy; a hammer weighing about a pound and a quarter, of an elliptical form, pointed at the ends, the area of end being about $\frac{1}{10}$th part of a square inch, appears to be best suited for ordinary purposes.

The turf of bog, being carbonized, makes excellent fuel, and may be employed in the manufacture of iron, and such iron is extremely malleable. Turf fuel is also used most extensively in working the steam engine in many districts of Ireland; it is used on board the Dunally steam-boat for engines of eighteen-horse power, and the expense is fourpence per mile.

June 26, 1838.

The PRESIDENT in the chair.

A discussion took place on the effect of turf fuel on iron, and on the methods and principles of hardening iron.

A communication was read from Mr. Buck on the relation betwixt the diameter and intermediate spaces of the tubes in a locomotive boiler, for the production of an unanimous effect in the generation of steam.

List of Patents

Granted by the French Government from the 1st of October to the 31st of December, 1837.

(Concluded from p. 374, vol. xii.)

To Jean François Cail, of Paris, for an apparatus for extracting the juice from the pulp of beetroot.

— Marquis of Louvois, peer of France, for a railroad with only one rail, and with double waggons and moveable regulators.

— Louis Camille Eugène Duverger, of Paris, for new printing processes, called by him "typography by application and incrustation."

— Thomas François André Stackler, of Rouen, for improvements in printing woven goods.

— Jules Aimé Philippe Lachapelle, of Landrecies, for a means of using dross in blast furnaces.

— François Claude Bazin, of Paris, for a means of printing by incrustation, skins, woven goods, paper, and parchment.

— Thomas Dowcett, of London, for a new method of stitching and binding books.

— Evrard and Hocque Desmazures, of Valenciennes, for a brick-making machine.

— François Marie Lanoe, of Paris, for a machine for making the fringe of shawls.

— Guillot, father and son, of Paris, for a cellular coach for conveying prisoners.

To Priqueler, father and son, of Plencher les Mines, for improvements in locks.

— Eyquem, of Bordeaux, for a means of closing glass bottles with glass stoppers.

— François Darbo, of Paris, for an improved sucking bottle.

— George Crane, iron-master, for a means of reducing ore.

— Emile Grimpé, of Paris, for a means of preventing the counterfeit of Government stamps.

Granted from the 1st of January to the 31st of March, 1838.

PATENTS FOR FIFTEEN YEARS.

To John Lee Nicholson, of Manchester, represented in Paris by Mr. Perpigna, advocate of the French and Foreign Office for Patents, Rue de Choiseul, for improvements in spinning machines.

— Charles Marie Joseph Ghislain Decartier, of Valenciennes represented in Paris by Mr. Perpigna, for a hydrorotary machine, calculated to supersede steam engines.

— Pierre Edouard Barthélemy, M.D., represented in Paris by Mr. Perpigna, for the application of caoutchouc to many useful purposes, both in industry and in the medical art.

— Waddington, brothers, cotton-spinners, represented in Paris by Mr. Perpigna, for improvements in bleaching linens and other like substances, and in the machines employed for the same purpose.

— John Petrie, engineer, of Rochdale, represented in Paris by Mr. Perpigna, for improvements in the construction of locomotives for railroads and common roads, which improvements are applicable to stationary steam engines or to those employed for navigation.

— William Fairbairn, engineer, of Manchester, represented in Paris by Mr. Perpigna, for improvements in the means employed to unite sheets of metal used in the construction of boilers, and for other purposes.

To William Harper, of London, represented in Paris by Mr. Perpigna, first, for a prepared or improved fuel fit to warm apartments, churches, or other buildings, hot-houses, or other places in which artificial heat is required; and, secondly, for stoves fitted for burning such fuel.

— Nicolas Schlumberger, of Guebwiller, represented in Paris by Mr. Perpigna, for improvements in the machines employed for spinning and twisting cotton, worsted, flax, and other like substances.

— Louis Jean Népomucène Marie Rousseau, of Trifletz, for a wine-making apparatus.

— The Coal Company of Douchy, for a machine to pierce the wall in coal-mines.

— Jacques Baile, of Lyons, for a frame called knitter, fit to execute all the movements in knitting.

— Auguste Guibout, Marie St. Germain, and to Méritens, of Paris, for the application of gold tissue and jewellery to the making of epaulettes, aiguillettes, and other like objects.

— Pierre Adolphe Lebedel, of Paris, for a machine which makes five imitation pearls at once.

— Jean Michel Keinhart, of Strasburgh, for double rotatory mills.

— Amant Faulcon, of Paris, for a locomotive engine.

— Jean Gregoire, of Paris, for an application to the box of a wheel, which diminishes the friction.

— Pierre Fortin, of Orleans, for apparatuses called animal destroyers, fit for the destruction of wild beasts.

— Théodore Marie Souchon, of Brest, for a double-winded forge bellows.

— Jean Jacques Hopwood, of Boulogne sur Mer, for a machine to wash, clean, and bleach linens, cottons, and all other fibrous and vegetable substances.

— Georges Frédéric Schmidt, of Paris, for improved stoves.

— Andre François Gaupillat, of Paris, for the rectifying of the nitric ether produced in the manufacturing of fulminate of mercury.

To Pierre Aurias, of Pezenas, for an improved kind of furniture.

— Leon Castellain, of Paris, for improvements in the distilling of alcohol.

— Walker Wood, of London, for an improved locomotive engine.

— Antoine Elzeard Tardieu, for a machine for manufacturing horse-shoes.

— Jean Pierre Xavier Clerc, of Belfort, for improvements in printing calicoes and other fabrics.

— Alliot, of Nantes, for a smoke-consuming furnace.

— Pierre François Guebhard, banker, of Paris, for a propelling wheel, applicable to ships'-boats, &c.

— Simonet de Changy, of Paris, for a new system of melting and purifying fat, oil, and rosin.

— François Berjou, of Paris, for a new horse-shoe without nails, called *hippo-sandale hermetique.*

— Guillaume Bocquet and Pierre Marie Eugene Champion Nansouty, of Paris, for a method of preparing iron ore, which disoxidates the ore before introducing it into the blast furnace.

— Edwin Emmanuel Cocker, of London, for a machine to make needles, pins, &c.

— Onésiphore Pecqueur, of Paris, for improvements applicable to railroads and locomotives.

List of Patents

Granted in Scotland between 22d January and 22d February, 1839.

To Edward Cooper, of Piccadilly, stationer, in consequence of a communication made to him by a foreigner residing abroad, for improvements in the manufacture of paper.—23rd January.

— Peter Taylor, of Birchin Bower within Chatterton, Lancashire, rope-maker, for improvements in machinery for propelling vessels, carriages, and machinery, parts of which improvements are applicable to the raising of water.—23rd Jan.

— Frederick Cayley Worsley, of Holywell-street, London, for certain improvements in locomotive engines and carriages.—24th January.

To Thomas Walker, of Birmingham, clock-maker, for improvements in steam-engines, which improvements are also applicable to the raising or forcing fluids.—24th January.

— Thomas Sweetapple, of Cutterhall Mill, Godalming, Surrey, paper-maker, for an improvement or improvements in the machinery for making paper.—28th January.

— John Wilson, of Liverpool, lecturer on chemistry, for certain improvements in the process of manufacturing alkali from common salt.—30th January.

— Sally Thomson, of North-place, Gray's Inn-road, London, for certain additions to locks or fastenings for doors of buildings and of cabinets, and for drawers, chests, and other receptacles, for the purpose of affording greater security against intrusion by means of keys improperly obtained.—31st January.

— Job Cutler, of Lady Poole-lane, Birmingham, and Thomas Gregory Hancock, of Prince's-street there, machinist, for an improved method of condensing the steam in steam-engines, and supplying their boilers with the water thereby formed.—31st January.

— Horace Cory, of Narrow-street, Limehouse, London, B. M., for improvements in the manufacture of white lead.—7th February, 1839.

— Edward Samuell, of Liverpool, merchant, for improvements in the manufacture of soda.—7th February.

— Timothy Burstall, of Leith, engineer, for certain improvements in the steam-engine, and in apparatus to be used therewith, or with any other construction of the steam-engine, or any other motive power, for the more smooth and easy conveyance of goods and passengers on land and water, part of which will be applied to water power.—11th February.

— Charles Gabriel Baron de Suarce, of Red Lion-square, London, and William Pontifex, of Shoe-lane, London, for a new mode of obtaining vegetable extracts.—12th February.

— Morton Balmanno, of Queen-street, Cheapside, London, merchant, for a new and improved method of making and manufacturing paper, pasteboard, felt, and tissues, communicated by a foreigner residing abroad.—14th February.

To Joseph Burch, of Bankside, Blackfriars, Surrey, calico-printer, for certain improvements in printing cotton, woollen, paper, and other fabrics and materials.—14th February.

— Harrison Grey Dyar, of Cavendish-square, and John Hemming, of Edward-street there, for improvements in the manufacture of carbonate of soda.—19th February.

— Edward Pearson Tee, of Barnsley, dyer, for improvements in weaving linen and other fabrics.—20th February.

— Joseph Burnett, of Deptford, for improvements in steam-engines.—20th February.

New Patents
SEALED IN ENGLAND.
1839.

To Thomas Barnabas Daft, of Regent-street, gentleman, for certain improvements in inkstands, and in materials and apparatus for fastening and sealing letters or other documents.—Sealed 2d February—6 months for inrolment.

To Moses Poole, of Lincoln's-inn, gentleman, for improvements in the means of conveying and transporting persons and goods from one place to another.—Sealed 4th February—6 months for inrolment.

To John Evans, of Birmingham, paper-maker, for improvements in the manufacture of paper.—Sealed 4th February—6 months for inrolment.

To Thomas Robinson, of Wilmington-square, in the county of Middlesex, gentleman, for improvements in the process of rectifying or preparing spirituous liquors in the

CELESTIAL PHENOMENA, FOR MARCH, 1839.

D.	H.	M.	
1			Clock before the sun, 12m. 41s.
	—		☽ rises 7h. 7m. A.
	—		☽ passes mer. 0h. 41m. M.
	—		☽ sets 7h. 11m. M.
			Encke's Comet R. A. 20h. 59m. dec. 23. 36.
			Ditto passes mer. 22h. 21m.
	7	42	♂ in conj. with the ☽ diff. of dec. 4. 31. N.
2	12		♃ in Aphelion.
	15	1	♃'s first satt. will im.
3	4	2	♅ in conj. with the ☉.
	4	34	♃ in conj. with the ☽ diff. of dec. 4. 0. N.
	15		☽ in Apogee.
4	4	17	♀ greatest hel. lat. S.
5			Clock before the sun, 11m. 50s.
	—		☽ rises 11h. 54m. A.
	—		☽ passes mer. 3h. 21m. M.
	—		☽ sets 7h. 52m.
			Encke's Comet R. A. 21h. 7m. dec. 23. 2.
			Ditto passes mer. 22h. 14m.
	16	37	♃'s second satt. will im.
6	13	41	♃'s third satt. will im.
	16	22	♃'s third satt. will em.
7	13	40	♄ in conj. with the ☽ diff. of dec. 7. 5. N.
	18	13	☿ in conj. with ♅ diff. of dec. 1. 18. S.
8	1	32	☽ in □ or last quarter.
9	16	54	♃'s first satt. will im.
10			Clock before the sun, 14m. 33s.
	—		☽ rises 5h. 42m. M.
	—		☽ passes mer. 8h. 52m. M.
	—		☽ sets 0h. 2m. A.
			Encke's Comet R. A. 21h. 16m. dec. 22. 21.
			Ditto passes mer. 22h. 3m.
11	11	23	♃'s first satt. will im.
	18	33	♂ in oppo. to the ☉.
13	1	5	☿ in sup. conj. with the ☉.
14	—		Mercury R. A. 23h. 41m. dec. 3. 36. S.
	—		Venus R. A. 0h. 52m. dec. 4. 41. N.
	—		Mars R. A. 11h. 29m. dec. 7. 30. N.
	—		Vesta R. A. 6h. 8m. dec. 25. 9. N.
	—		Juno R. A. 21h. 48m. dec. 7. 21. S.
	—		Pallas R. A. 13h. 23m. dec. 8. 7. S.
	—		Ceres R. A. 13h. 41m. dec. 6. 6. N.
	—		Jupiter R. A. 13h. 2m. dec. 4. 57. S.
	—		Saturn R. A. 16h. 35m. dec. 20. 9. S.
14	—		Georg. R. A. 22h. 59m. dec. 7. 20. S.
	—		Mercury passes mer. 0h. 15m.
	—		Venus passes mer. 1h. 26m.
	—		Mars passes mer. 12h. 1m.
	—		Jupiter passes mer. 13h. 34m.
	—		Saturn passes mer. 17h. 7m.
	—		Georg. passes mer. 23h. 29m.
	7	52	♅ in conj. with the ☽ diff. of dec. 0. 24. N.
15			Partial eclipse of the sun,
	3	23	Begins
	3	44	Greatest phase mean time.
	4	4	Ends
	—		Magnitude of the eclipse 0.05 on the southern limb.
	2	13	Ecliptic conj. or ● new moon.
	7	2	☿ in conj. with the ☽ diff. of dec. 1. 37. S.
	—		Clock before the sun, 9m. 15s.
	—		☽ rises 6h. 20m. M.
	—		☽ passes mer. 0h. 5m. A.
	—		☽ sets 6h. 8m. A.
			Encke's Comet R. A. 21h. 25m. dec. 21. 41.
			Ditto passes mer. 21h. 52m.
	23		☽ in Perigee.
16	16	18	♀ in conj. with the ☽ diff. of dec. 3. 5. S.
18	13	16	♃'s first satt. will im.
20			Clock before the sun, 7m. 47s.
	—		☽ rises 7h. 50m. M.
	—		☽ passes mer. 4h. 39m. A.
	—		☽ sets 0h. 17m. M.
			Encke's Comet R. A. 21h. 33m. dec. 21. 2.
			Ditto passes mer. 21h. 41m.
	1	43	♄ stationary.
	19	1	☉ enters Aries, Spring com.
22	5	29	☽ in □ or first quarter.
23	3	59	☿ in the ascending node.
	11	4	♃'s second satt. will im.
24	22	45	Vesta in □ with the ☉.
25			Clock before the sun, 6m. 15s.
	—		☽ rises 1h. 45m. A.
	—		☽ passes mer. 9h. 15m. A.
	—		☽ sets 4h. 40m. M.
			Encke's Comet R. A. 21h. 41m. dec. 20. 25.
			Ditto passes mer. 21h. 29m.
	15	10	♃'s first satt. will im.
27	9	38	♃'s first satt. will im.
	17	6	♂ in conj. with the ☽ diff. of dec. 2. 52. N.
		29	☿ in Perihelion.
30	2	19	Ecliptic oppo. or ○ full moon.
	4	51	♃ in conj. with the ☽ diff. of dec. 3. 47. N,
	23		☽ in Apogee.
31	19	10	Pallas in oppo. to the ☉, intens. of light 1.859.

J. LEWTHWAITE, Rotherhithe,

Supplement.

CONTAINING DESCRIPTIONS OF THOSE INVENTIONS FOR WHICH PATENTS WERE GRANTED IN THE YEAR 1832, BUT WHICH HAVE NOT BEEN BEFORE REPORTED IN THIS JOURNAL.

To Thomas Howard, *of Copthall-court, late of New Broad-street, in the city of London, merchant, for improvements on his former invention, denominated the vapour engine; and the application of a part or parts thereof, with certain additions or improvements to steam engines.*—[Sealed 29th November, 1832.]

In vol. xiv. of our First Series, page 181, will be found a description of the machine above alluded to, for which a patent was granted 13th October, 1825.

The Patentee states that his improvement assimilates to the construction of a Bolton and Watt's engine, inasmuch that it has a distinct chamber for condensing placed at the side of the working cylinder.

The rude sketch accompanying the specification, represents the section of a working cylinder and piston enclosed within another vessel, in which an elastic vapour from alcohol is generated by means of a jet or spray of the liquid being injected and thrown upon a heated surface, produced by a mercurial bath over a furnace below; the whole being surrounded by a jacket enclosing the furnace and flues.

By what means the elastic vapour produced is made to work the piston within the cylinder is not shown; but presuming it to have so acted, the vapour from the eduction is to be passed off into the contiguous vessel, there to become condensed.

This condenser has a worm tube, through which the eduction vapour flows, and becoming condensed and cooled toward the bottom, is then forced through the pipe to the jet before mentioned a partially heated liquor, and thrown out in a spray upon the heated surface, and thereby converted into an highly elastic vapour.

The claim of novelty is principally in the connexion of the condensing vessel to the vapour engine, by which the liquor may be used over and over again without losing much of the heat, and allowing none of the vapour to escape into the atmosphere: the other points are unimportant.—[*Inrolled in the Inrolment Office, May,* 1833.]

To RICHARD WHYTOCK, *of the city of Edinburgh, manufacturer, for his invention of an improved method or manufacture, which facilitates the production of regular figures or patterns on different fabrics, particularly velvet, velvet pile, and Brussels, Wilton, and Turkey carpets.*—[Sealed 8th September, 1832.]

THE pattern or design intended to be woven upon the face of the carpet or other goods, is first produced in colours upon the warp yarns, in order that such coloured parts of the yarns may be brought up on to the surface in the operation of plain weaving, and thereby produce a pattern or design without the use of a draw bog, or Jacquard, or other contrivance usually employed for the production of figured fabrics.

The Patentee states that he is aware of Mr. Burnet Woodcroft's invention, in which, by printing warp yarns in their distended form, when beamed or prepared for introduction into the loom, he is enabled to weave speckled fabrics (see vol. i. of our Second Series, p. 32); and, also, of the invention of Mr. Schawbe, for weaving coloured devices upon fabrics by similar means (see vol. iv. of our Conjoined Series, p. 76): but he considers his invention essentially different, inasmuch as he prints his yarns before they are beamed, taking care to adjust the positions of the several colours in the yarns when beamed, so that they shall exactly produce the required pattern in the loom. To use a nautical expression, we should say this is "sailing very near the wind," for the warp yarns are to be printed before woven, and the coloured parts raised up to produce the pattern, as described in the specifications of the above-mentioned patents: we do not, therefore, perceive any essential feature of novelty in the present invention, the nice distinction appearing to us to be without difference.

The yarns are to be tightly wound upon a cylinder, and, by means of a graduated scale, applied both longitudinally and transversely: the yarns are all numbered in breadth across the cylinder, and also the distances in length round the cylinder, which will be occupied by the weft threads when woven. By the assistance and direction of a plan of the pattern similarly arranged, drawn, and coloured, the workman now dabs upon the yarns at the proper parts the several colours to form the pattern, which he effects by means of felted sticks dipped into the said colours, and thence transform the said colours to the different portions of the yarns whilst they are thus distended round the cylinder. Necessary precautions being taken to dry the colours, the yarns are then slipped off the cylinder in loose hanks, by causing a portion of the cylinder to collapse; and the hanks being then tied up in the usual way, they are submitted to steam, in order to fix the colours. After this, the yarns are placed in the loom, and the pattern produced by raising the coloured portions of the warp in the process of plain weaving.—[*Inrolled in the Inrolment Office, March,* 1833.]

To ALEXANDER BEATTIE SHANKLAND, *of Liverpool-street, in the city of London, Esq., in consequence of a communication made to him by a foreigner residing abroad, for a new method of spinning wool.*—[Sealed 5th July, 1832.]

THE subject of this patent is the same as the invention for spinning flax and hemp, reported at page 25, of the present volume. The wool, in this instance, having been opened by a scribbling engine or otherwise, is placed round a cylindrical drum, and held there by means of hooks or staples set in the periphery of the drum; from whence the fibres of wool are drawn off by the sharp points of a sort of star-wheel, mounted and revolving in a bowl-shaped spindle.

The loose fibres thus received, pass from the star through a slit or groove in the bowl spindle, and become twisted or spun by its rotation; and the cord, thus formed, proceeds upward through conducting rollers, and is wound upon a reel above.

The other details of the machine, and the mode of driving, is the same as in other spinning machinery.—[*Inrolled in the Inrolment Office, September,* 1832.]

To Joseph Crawhall, *of the town and county of Newcastle-upon-Tyne, rope-maker, for his invention of an improvement in the manufacture of flat ropes, such as are used in mines.*—[Sealed 8th August, 1832.]

The Patentee considers that a flat rope, composed of, or made from, strands of ropes that have been twisted and laid at different times, and thereby been subject to different degrees of tension, cannot possess a uniform strength, beside having other objections. He, therefore, proposes to twist and lay all the strands which are to form one flat rope in one machine at the same time, and by the same operation.

The elementary parts of this machine are not varied from the ordinary construction of mechanism employed for laying ropes, but the improved machine consists of several of the twisting ordinary apparatus combined in one frame, and driven simultaneously by coupling wheels connected to one first mover.

The ordinary mechanism employed is the frustrum of a cone revolving upon a horizontal axle. The cone has three notches or openings along it, each of which receives one strand of rope, which is passed through the length of the cone; and the three strands meet, and are twisted or laid together at the apex. The improved machine has several of these cones mounted in its framework, all driven by one rotary power: hence all the strands of rope receive the same quantity of twist, and are laid with the same degree of tension.

This is the invention, and for this mode of making flat ropes the Inventor claims his patent.—[*Inrolled in the Inrolment Office, September,* 1832.]

To THOMAS ALCOCK, *of the parish of Claines, in the county of Worcester, lace-manufacturer, for his invention of certain improvements in machinery for manufacturing bobbin-net lace.*—[Sealed 18th December, 1832.]

THE specification of this patent commences with a history of lace-making machinery, inorder to introduce to the reader a certain peculiar construction of machinery, known in the trade as Brown's traverse warp machine and Lever's machine, upon which principles of construction the present improvements are engrafted.

This document is of considerable length, and goes into a great minutia of detail; but the main features may be described in a few words.

The invention consists in the adaptation of two extra point bars (the nature of which are well known.) These new points are for two objects; the one is for lifting up the crossed traverse warp threads, the other for holding such raised threads whilst the bobbin carriages pass, and the ordinary operations of the machine go on to perfect the twist, and form the mesh of the net.

Another feature of the improvement applicable to a Lever's machine, is forming certain of the bobbin carriages with thick parts at top, for the purpose of enabling them to keep open the warp for the taking up points to enter.

It would be in vain to attempt a particular description of these improvements without enlarged representations of the working parts of the machines to which they apply. We shall, therefore, merely state that these extra points hang in the machine below the ordinary points in perpendicular positions, the ends of the points being bent at an angle, and that they are raised up into operation at certain periods by means of levers acting upon a cam on a rotary shaft.

The Patentee claims, as the matter of his invention, the lifting points for taking up the crossed threads, and the holding points for retaining them, and also the thickening of the tops of the alternate carriages, for keeping open the way through the warp, for the taking up points to enter.—[*Inrolled in the Rolls Chapel Office, May,* 1833.]

To THOMAS ALCOCK, *of the parish of Claines, in the county of Worcester, lace-manufacturer, for his invention of certain improvements in machinery for manufacturing bobbin-net lace.*—[Sealed 18th December, 1832.]

THIS appears to be an adaptation of the parts of the preceding specification to the principles of a traverse warp machine, in conjunction with Henson and Jackson's fluted roller machines, the improvements for design making many narrow breadths of lace in one sheet, by a single tier of bobbins, the selvages of which breadths are connected by what are called whipping threads.

The description of this improvement is still more lengthy than the preceding, and is accompanied with many large and complicated drawings, showing the details of the contrivance; but which we do not consider to be of sufficient importance to require a very elaborate report here. In short, the claim with which the specification closes will give as satisfactory an account of what the Patentee considers he has invented, as any epitome of the matter which we might be able to draw out from a careful analysis of this inrolled document.

The Patentee says, that he claims "combining together, in the manner shown, for the purpose of making breadths of bobbin-net lace, the several parts of Brown's traverse warp machinery, called spools, forks, and dividers; with the several parts of Henson and Jackson's fluted bar or fluted roller machine, called bobbin carriages, combs, and fluted bars or rollers; together with the new parts, called lifting points, and holding points, and extra thicknesses at the tops of the carriages" (as described in the foregoing specification of a patent of the same date as this, and under the same title). He also claims the peculiarity of the combs, as to their positions, being in leads which are placed on bars very near the middle of the machine, there being no fluted bars near the warps, and only two employed, which are situate under the middle part of each comb.—[*Inrolled in the Rolls Chapel Office, June,* 1833.]

To ROBERT SELBY, *of Burleigh-street, Strand, in the county of Middlesex, wine-merchant, for an invention communicated to him by a foreigner residing abroad, of certain improvements in the making or constructing of bedsteads, sofas, couches, and other articles for ease or comfort.*—[Sealed 20th December, 1832.]

THIS is an improvement in camp bedsteads, sofas, or couches, by which they are enabled to be folded into close compass, for the more convenient stowage or travelling. The frame of the bedstead, sofa, or couch, is made by two horizontal rods of iron curled up at the ends, forming the sides, to which legs are attached by screwing them into sockets in the under parts of the horizontal rods. These two side frames are connected together by transverse stretchers, which are made with a hinge joint in the middle; and at their ends have sockets, which turn freely on the upper parts of the legs. A covering of sail-cloth or such material, having some degree of elasticity, is to be attached, by sewing or otherwise, to the side rails, and when the stretchers are opened, the covering will be drawn tight: it may be further supported by diagonal cross bands.

In order to pack up the bedstead, sofa, or couch, it is only necessary to collapse the jointed stretchers, when the side frames will fall together and lay flat, occupying very little room.—[*Inrolled in the Inrolment Office, June,* 1833.]

To THOMAS PARSONS, *the younger, of Furnival's-inn, gentleman, for his invention of certain improvements on locks for doors and other purposes.*—[Sealed 20th December, 1832.]

THIS improvement is described as consisting in the employment of lever tumblers in connexion with loose tumblers for door locks, by which the bolt may be held securely both in a locked or unlocked state. Lever tumblers, that is, thin plates of various forms, have been applied to locks in a great variety of ways and shapes, for the purpose of dropping into notches in the edge of the bolt, from which they can only be raised, and the bolt slidden, by a key with indentations on its edge, answering to the positions of all the tumblers. In this instance, it appears that certain other auxiliary tumblers, called loose tumblers, are to be connected to the lever tumblers, to give additional security.

It is proposed that these tumblers should be made of very thin plates of metal, so that, by their introduction, the thickness of the lock will not be increased, and yet perfect security obtained. The form and position of these additional tumblers appears to be the whole matter of novelty; but the advantages are not very obvious.

There is also a suggestion for making the bolt of a padlock or other lock in two thin pieces, placed in contact, so as to render it difficult to open them by any means but by the proper key; and there are parts appended capable of being shifted, if required, so that, under certain circumstances, even the proper key shall not open the lock without its parts being first adjusted to the secret cue.—[*Inrolled in the Inrolment Office, June,* 1833.]

To WILLIAM HENRY JAMES, *of Thavies-inn, Holborn, in the city of London, engineer, for his invention of certain improvements in the construction of steam carriages, and the apparatus or machinery for propelling the same; part of which improvements are applicable to other purposes,* —[Sealed 15th August, 1832.]

THE subject of this patent is an arrangement of mechanism for actuating a locomotive carriage upon ordinary roads; consisting of a steam engine, boiler, furnace, blower, and other apparatus for driving a wheeled carriage. It does not appear that any feature of novelty is proposed in this mechanism beyond its mere arrangement, applicable to the purpose of locomotion; but in the construction of the boiler, something new is professed to exist: what that particular novelty may consist in, we have not been able to discover.

The boiler is made of a series of flat water chambers, placed one above another nearly in horizontal positions; but slightly inclining, which chambers communicate with each other by tubes, and the flues from the furnace passes in a zigzag form between the chambers, in order that the heat may act upon the extensive surface of the boiler.

The driving power of the engine is communicated to the wheels by endless bands or chains passed over pulleys on each side of the carriage; and in the event of the required track of the carriage being in a curved line, the driving chain on one side of the carriage may be thrown off the wheel by the conductor, and thereby prevent the friction which would occur from forcing the wheels to revolve uniformly over unequal distances.—[*Inrolled in the Inrolment Office, February,* 1833.]

To JAMES WILLIAM DURANT, *of Brewer-street, Somers-town, in the parish of St. Pancras, and county of Middlesex, smith, for his invention of an improved mode or modes, method or methods of securing, combining, and preserving printed, written, or plain papers; printing, drawings, music, or other similar matters; so as to be readily accessible, easily referred to, and capable of being taken asunder, and replaced at any time with facility.*—[Sealed 12th October, 1832.]

WHEN any number of sheets of paper are required to be connected together in a sort of temporary binding, so that their back edges may be securely held, yet capable of being separated at pleasure, the Patentee places all the back edges of the several sheets in contiguity, and carefully adjusts them; then he applies two straight bars of iron, or any other suitable material, one on each side of the parcel of sheets, within a short distance (say half an inch) of the back edges, and presses these two bars together by a screw, or other means, so as to cause the bars to take part hold of the sheets, which will connect them as if bound in a book.

The subject of the above patent is this parallel apparatus, formed very much like a parallel ruler, the two bars being connected near their top and bottom ends by two jointed transverse metal straps or levers, which allow the parallel bars to recede from, or approach toward, each other. A screw shaft having right and left handed threads, is connected to the two transverse straps or levers; and by turning this screw shaft, these levers are moved so as to draw the parallel bars together, and cause them to hold the edges of the sheets firmly, or to open the parallel bars for liberating and separating the sheets.

The Patentee contemplates that these parallel bars or holders, constructed on the same principle, may be made to open and close by various mechanical means; but his invention appears to consist in the employment of parallel bars for the purposes stated, when brought together or removed asunder by the agency of a right and left handed screw acting upon the jointed connecting strap levers.—[*Inrolled in the Inrolment Office, April,* 1833.]

To JOHN BURLINGHAM, *of Old Buckenham, near Attleborough, in the county of Norfolk, for his invention of certain improvements on mills or machinery to be operated upon by wind, and applicable to the grinding of corn and other purposes.*—[Sealed 8th November, 1832.]

THESE improvements in windmills apply to the construction of the sails of the mill. The Patentee considers that a great increase of power would be obtained, if the sails, instead of being placed in the form of a cross, were formed by radial vanes filling up the whole circular space.

These vanes are severally made to turn upon pivots, one of which is set in the central block, the other in an outer rim that circumscribes the whole. The mode of turning these vanes, according to the state of the wind, in order to regulate the power, is by a sliding apparatus within the hollow shaft, connected by cranks to the vanes. An important feature, as it is considered by the Patentee, is the forming of a rim box or ring, either circular or polygonal, round the outer part or ends of the vanes, for the purpose of confining the wind, and thereby increasing its power.—[*Inrolled in the Inrolment Office, January,* 1833.]

To JOSEPH GIBBS, *of the Kent-road, engineer, and* AUGUSTUS APPLEGATH, *of Crayford, calico-printer, both in the county of Kent, for their invention of certain improvements in machinery for cutting out wood for carriage wheels, and for cutting and shaping the wheels.*—[Sealed 22d September, 1832.]

THIS is a modification of the block-making machinery, consisting of circular saws and other rotary cutters, in connexion with sliding rests and guides, so constructed and arranged, that the spokes, felloes, and boxes of wheels may be formed and fitted, and the wheels finished by machinery, without the aid of manual labour. The specification is of considerable length, and accompanied by numerous drawings.

The box of the wheel having been turned in a lathe in the ordinary way, is then fixed upon the centre of a dividing plate, on which are mounted several drills placed radially. By means of these drills, the holes in the box are accurately bored at equal distances apart, according to the required number of spokes.

The wood for forming the spokes having been cleft to the proper dimensions, each spoke is placed in a sort of lathe, and is there operated upon by a travelling cutter, guided by levers which act against a pattern spoke in order to produce the desired form. The ends of the spokes are cut in another machine by circular saws, and they are, therefore, all made to one exact size and figure.

The felloe of the wheel is formed by several segment pieces of wood, placed on circular side rests, and cut, also, by circular saws, and their junctions or ends are socketted by other parts of the machinery.

The parts of the wheel being completely put together, the whole is finished by being trimmed to its required shape in another machine by rotary cutters.— [*Inrolled in the Inrolment Office, November,* 1832.]

ORIGINAL COMMUNICATION.

ON THE CAOUTCHOUC MANUFACTURE.

BY ANDREW URE, MD., F.R.S., &c. &c.

(*To the Editor of the London Journal of Arts.*)

SIR,

THIS department of operative industry has, within a few years, acquired an importance equal to some of the older arts, and promises, ere long, to rival even the ancient textile fabrics in the variety of its designs and applications. The manufacture of caoutchouc has, at present, three principal branches—1. The condensation of the crude lumps or shreds of caoutchouc, as imported from South America, India, &c., into compact homogeneous blocks, and the cutting of these blocks into cakes or sheets for the stationer, surgeon, shoemaker, &c. 2. The filature of either the Indian rubber bottles, or the artificial sheet caoutchouc, into tapes and threads of any requisite length and fineness; which, being clothed with silk, cotton, linen, or woollen yarns, form the basis of elastic tissues of every kind. 3. The conversion of the refuse cuttings and coarser qualities of caoutchouc into a viscid varnish, which, being applied between two surfaces of cloth, constitutes the well-known double fabrics, impervious to water and air.

I. The caoutchouc, as imported in skinny shreds, fibrous balls, twisted concretions, cheese-like cakes, and irregular masses, is, more or less, impure, and sometimes fraudulently interstratified with earthy matter. It is cleansed by being cut into small pieces, and washed in warm water. It is now dried on iron trays, heated with steam, while being carefully stirred about to separate any remaining dirt, and is then passed through, between a pair of iron rolls, under a stream of water, whereby it gets a second washing, and becomes, at the same time, equalised, by the separate pieces being blended together. The shreds and cuttings thus laminated, if still foul or heterogeneous, are thrown back into a kind of hopper over the rolls, set one-sixteenth of an inch apart, and passed several times through between them. The above method of preparation is that practised by Messrs. Keene and Co., of Lambeth, in their excellent manufactory, under a patent granted in October, 1836, to Christopher Nickels, a partner in the firm.

In the great establishment of the Joint-Stock Caoutchouc Company, at Tottenham, under the direction of Mr. Sievier, a gentleman distinguished no less by his genius and taste as a sculptor, than by his constructive talents, the preparatory rinsing and lamination are superseded by a process of washing practised in Mr. Nickels's second operation, commonly called the *grinding*, or, as it should more properly be styled, the *kneading*. The mill employed for agglutinating or incorporating the separate fragments and shreds of caoutchouc into a homogeneous elastic ball, is a cylindrical box or drum of cast iron, eight or nine inches in diameter, set on edge, and traversed in the line of its horizontal axis (also eight or nine inches long) by a shaft of wrought iron, furnished with three rows of projecting bars, or kneading arms, placed at angles of 120 deg. to each other. These act by rotation against five chisel-shaped teeth, which stand obliquely up from the front part of the bottom of the drum. The drum itself consists of two semi-cylinders; the under of which is made fast to a strong iron framing, and the upper is hinged to the under one behind;

but bolted to it before, so as to form a cover or lid, which may be opened or laid back at pleasure, in order to examine the caoutchouc from time to time, and take it out when fully kneaded. In the centre of the lid a funnel is made fast, by which the cuttings and shreds of the Indian rubber are introduced, and a stream of water is made to trickle in, for washing away the foul matter often imbedded in it. The power required to turn the axis of one of these mills, as the drums or boxes are called, may be judged of from the fact, that if it be only two inches in diameter, it is readily twisted asunder, and requires to be three inches to withstand every strain produced by the fixed teeth holding the caoutchouc against the revolving arms. Five pounds constitute a charge of the material.

One of the most remarkable phenomena of the kneading operation, is the prodigious heat disengaged in the alternate condensation and expansion of the caoutchouc. Though the water be cold as it trickles in, it soon becomes boiling hot, and emits copious vapours. When no water is admitted, the temperature rises much higher, so that the elastic lump, though a bad conductor of heat, cannot be safely touched with the hand. As we shall presently find that caoutchouc suffers no considerable or permanent diminution of its volume by the greatest pressure which can be applied, we must ascribe the heat evolved in the kneading process to the violent intestine movements excited throughout all the particles of the elastic mass.

During the steaming, much muddy water runs off through apertures in the bottom of the drum. In the course of half an hour's trituration, the various pieces become agglutinated into a soft, elastic, ovoid ball, of a reddish brown colour. This ball is now transferred into another similar iron drum, where it is exposed to the pricking and kneading action of three sets of chisel points, five in each set, that project from the revolving shaft at angles of 120 deg. to each other, and which encounter the resistance occasioned by five stationary chisel teeth, standing obliquely upwards from the bottom of the drum. Here the caoutchouc is kneaded dry along with a little quicklime. It soon gets very hot, discharges in steam through the punctures, the water and air which it had imbibed in the preceding washing operation, becomes, in consequence, more compact, and, in about an hour, assumes the dark brown colour of stationers' rubber. During all this time frequent explosions take place, from the expansion and sudden extrication of the imprisoned air and steam.

From the second set of drums the ball is transferred into a third set, whose revolving shaft, being furnished with both flat pressing bars, parallel, and sharp chisels, perpendicular to it, exercises the twofold operation of pricking and kneading the mass, so as to condense the caoutchouc into a homogeneous solid. Seven of these finished balls, weighing, as above stated, five pounds each, are then introduced into a much larger iron drum of similar construction, but of much greater strength, whose shaft is studded all round with a formidable array of blunt chisels. Here the separate balls become perfectly incorporated into one mass, free from honeycomb-cells or pores, and therefore fit for being squeezed into a rectangular or cylindrical form in a suitable cast-iron mould, by the action of a screw-press. When condensed to the utmost in this box, the lid is secured in its place by screw bolts, and the mould is set aside for several days. It is a curious fact, that Mr. Sievier has tried to give this moulding force, by the hydraulic press, without effect, as the cake of caoutchouc, after being so condensed, resiles much more considerably than after the compressing action of the screw. The cake form generally preferred for the recomposed, ground, or milled caoutchouc, is a rectangular mass, about 18 inches long, 9 inches broad, and 5 inches thick.

This is sliced into cakes for the stationer, and into sheets for making tapes and threads of caoutchouc, by an ingenious self-acting machine, in which a straight steel blade, with its edge slanting downwards, is made to vibrate most rapidly to and fro in a horizontal plane; while the cake of caoutchouc, clamped or embraced at each side between two strong iron bars, is slowly advanced against the blade by screw-work, like that of the slide rest of a lathe. In cutting caoutchouc by knives of every form, it is essential that either the blade or the incision be constantly moistened with water; for otherwise the tool would immediately stick fast. Since the above straight vibrating knife slants obliquely downwards, the sheet which it cuts off spontaneously turns up over the blade in proportion as it is detached from the bottom mass of the cake. The thicker slices are afterwards cut by hand, with a wetted knife, into small parallelopipeds, for the stationer, the sections being guided rectangularly by saw lines in a wooden frame. The wholesale price of these is now reduced to 2s. per pound. Slices may be cut off to almost any desired degree of thinness, by means of an adjusting screw—mechanism that acts against a board which supports the bottom of the cake, and raises it by any aliquot part of an inch, the cutting blade being caused to vibrate always in the same horizontal plane. These thin slices constitute what is called sheet caoutchouc, and they serve perfectly for making tubes for pneumatic apparatus, and sheaths of every kind; since, if their two edges be cut obliquely with clean scissors, they may be made to coalesce, by gentle pressure, so intimately, that the line of junction cannot be discovered either by the eye, or by inflation of a bag or tube thus formed.

The mode of recomposing the cuttings, shreds, and coarse lumps of caoutchouc into a homogeneous elastic cake, specified by Mr. Nickels, for his patent, sealed October 24, 1836, is not essentially different from that above described. The cylinders of his mill are more capacious, are open at the sides like a cage, and do not require the washing apparatus, as the caoutchouc has been cleansed by previous lamination and rinsing. He completes the kneading operation, in this open cylinder, within the space of about two hours, and afterwards squeezes the large ball so formed into the cheese form, in a mould subjected to the action of a hydraulic press. As he succeeds perfectly in making compact cakes in this way, his caoutchouc must differ somewhat in its physical constitution from that recomposed by Mr. Sievier's process. He uses a press of the power of 70 tons; such pressure, however, must not be applied suddenly, but progressively, at intervals of two or three minutes between each stroke; and when the pressing is complete, he suffers the caoutchouc to remain under pressure till it is cold, when he thrusts it out of the mould entirely, or, placing his mould in the slide-rest mechanism, he gradually raises the caoutchouc out of it, while the vibrating knife cuts it into slices in the manner already described. The elegant machine by which these sheets are now so easily and accurately sliced, was, I believe, originally contrived and constructed by Mr. Beale, engineer, Church-lane, Whitechapel.

II. FILATURE OF CAOUTCHOUC FOR MAKING ELASTIC FABRICS.

Messrs. Rattier and Guibal mounted in their factory at St. Denys, so long ago as the year 1826 or 1827, a machine for cutting a disc of caoutchouc into a contiguous fillet spirally, from its circumference towards its centre. This flat disc was made by pressing the bottom part of a bottle of Indian rubber in an iron mould. I have described this machine under the article Elastic Bands, in my Dictionary of Arts, &c. A machine on the same principle was made the subject of a patent by Mr. Joshua Proctor Westhead, of Manchester, in Feb. 16, 1836; and, being constructed with the well-known precision of Manchester workmanship, it has been found to act perfectly well in cutting a disc of caoutchouc, from the circumference towards the centre spirally, into one continuous length of tape. For the service of this machine, the bottom of a bottle of India rubber of good quality being selected, is cut off and flattened by heat and pressure into a nearly round cake of uniform thickness. This cake is made fast at its centre by a screw nut and washer to the end of a horizontal shaft, which may be made to revolve with any desired velocity by means of appropriate pulleys and bands, at the same time that the edge of the disc of caoutchouc is acted on by a circular knife of cast steel, made to revolve 3000 times per minute, in a plane at right angles to that of the disc, and to advance upon its axis progressively, so as to pare off a continuous uniform tape or fillet from the circumference of the cake. During this cutting operation, the knife and caoutchouc are kept constantly moist with a slender stream of water. A succession of threads of any desired fineness are afterwards cut out of this fillet, by drawing it in a moist state through a guide slit, against the sharp edge of a revolving steel disc. This operation is dexterously performed by the hands of young girls. MM. Rattier and Guibal employed, at the above-mentioned period, a mechanism consisting of a series of circular steel knives, fixed parallel to each other at minute distances, regulated by interposed washers upon a revolving shaft; which series of knives acted against another similar series, placed upon a parallel adjoining shaft, with the effect of cutting the tape throughout its length into eight or more threads at once. An improved modification of that apparatus is described and figured in the specification of Mr. Nickels's patent of October, 1836. He employs it for cutting into threads the tapes made from the recomposed caoutchouc.

The body of the bottle of India rubber, and in general any hollow cylinder of caoutchouc, is cut into tapes by being first forced upon a mandril of soft wood of such dimensions as to keep it equally distended. This mandril is then secured to the shaft of a lathe, which has one end formed into a fine-threaded screw, that works in a fixed nut, so as to traverse from right to left by its rotation. A circular disc of steel, kept moist, revolves upon a shaft parallel to the preceding, at such a distance from it as to cut through the caoutchouc, so that, by the traverse movement of the mandril shaft, the hollow cylinder is cut spirally into a continuous fillet of a breadth equal to the thickness of the side of the cylinder. Mr. Nickels has described two methods of forming hollow cylinders of recomposed caoutchouc for the purpose of being cut into fillets by such a machine.

It is probable that the threads formed from the best India rubber bottles, as imported from Para, are considerably stronger than those made from recomposed caoutchouc, and therefore much better adapted for making Mr. Sievier's beautiful patent elastic cordage. When, however, the kneading operation has been skilfully performed, I find that the threads of the *ground* caoutchouc, as it is incorrectly called by the workmen, answer well for every ordinary purpose of elastic fabrics, and are, of course, greatly more economical, from the much lower price of the raw material.

Threads of caoutchouc are readily pieced by paring the broken ends obliquely with scissors, and then pressing them together with clean fingers, taking care to admit no grease or moisture within the junction line. These threads must be deprived of their elasticity before they can be made subservient to any torsile or textile manufacture. Each thread is *inelasticated* individually in the act of reeling, by the tenter boy or girl pressing it between his moist thumb and finger, so as to stretch it to at least eight times its natural length, while it is drawn rapidly through between them by the rotation of the power-driven reel. This extension is accompanied with condensation of the caoutchouc, as shown in my former paper (see this Journal for last month), and with very considerable disengagement of heat, as pointed out in Nicholson's Journal, upwards of 30 years ago, by Mr. Gough, the blind philosopher of Kendal. I attempted to stretch the thread, in the act of reeling, but found the sensation of heat too painful for my unseasoned fingers. The reels, after being completely filled with the thread, are laid aside for some days, more or fewer, according to the quality of the caoutchouc, the recomposed requiring a longer period than the bottle material. When thus rendered inelastic, it is wound off upon bobbins of various sizes, adapted to various sizes of braiding, or other machines, where it is to be clothed with cotton or other yarn.

The thread of the Joint-Stock Caoutchouc Company is numbered from 1 to 8. No. 1 is the finest, and has about 5000 yards in a pound weight; No. 4 has 2000 in the pound weight; and No. 8, 700, being a very powerful thread. The finest is used for the finer elastic tissues, as for ladies' silver and gold elastic bracelets and bands. The ropes made by Mr. Sievier with the strongest of the above threads, clothed with hemp, and worked in his gigantic braiding machine, possess, after they are re-elasticated by heat, an extraordinary strength and elasticity, and, from the nearly rectilinear direction of all the strands, can stand, it is said, double the strain of the best patent cordage of like diameter.

In treating of the manufacture of elastic fabrics, I have great pleasure in adverting to the ribbon looms at Holloway, which display to great advantage the mechanical genius of the patentee, Mr. Sievier. Their productive powers may be inferred from the following statement :—5000 yards of one-inch braces are woven weekly in one 18 ribbon loom, whereby the female operative, who has nothing to do but watch its automatic movements, earns 10s. a-week ; 3000 yards of two-inch braces are woven upon a similar loom in the same time. But one of Mr. Sievier's most curious patent inventions, is that of producing, by the shrinking of the caoutchouc threads in the foundation or warp of the stuff, the appearance of raised figures, closely resembling coach lace, in the weft. Thus, by a simple physical operation, there is produced, at an expense of one penny, an effect which could not be effected by mechanical means for less than one shilling.

[III. OF THE WATER-PROOF DOUBLE FABRICS.

The parings, the waste of the kneading operations above described, and the coarsest qualities of imported caoutchouc, such as the inelastic lumps from Para, are worked up into varnish, wherewith two surfaces of cloth are cemented, so as to form a compound fabric, impervious to air and water. The caoutchouc is dissolved either in petroleum (coal-tar) naphtha, or oil of turpentine, by being triturated with either of the solvents in a close cast iron pot, with a stirring apparatus, moved by mechanical power. The heat generated during the attrition of the caoutchouc, is sufficient to favour the solution, without the application of fuel in any way. These triturating pots have been called pug mills by the workmen, because they are furnished with obliquely pressing and revolving arms, but in other respects they differ in construction. They are 4 feet in diameter and depth, receive 13 cwt. at a time, have a vertical revolving shaft of wrought iron 4 inches in diameter, and make one turn in a second. Three days are required to complete the solution of one charge of the varnish materials. The proportion of the solvent oils varies with the object in view, being always much less in weight than the caoutchouc.

When the varnish is to be applied to very nice purposes, as bookbinding, &c., it must be rubbed into a homogeneous smooth paste, by putting it in a hopper, and letting it fall between a couple of parallel iron rolls, set almost in contact.

The wooden framework of the gallery in which the waterproof cloth is manufactured, should be at least 50 yards long, to give ample room for extending, airing, and drying the pieces; it should be 2 yards wide, and not less than 5 high. It is formed of upright standards of wood, bound with three or four horizontal rails at the sides and the ends. At the end of the gallery, where the varnish is applied, the web which is to be smeared must be wound upon a beam, resembling in size and situation the cloth beam of the weaver's loom. The piece is thence drawn up and stretched in a horizontal direction over a bar, like the breast beam of a loom, whence it is extended in a somewhat slanting direction downwards, and passed over the edge of a horizontal bar. Above this bar, and parallel to it, a steel-armed edge of wood is adjusted, so closely as to leave but a narrow slit for the passage of the varnish and the cloth. This horizontal slit may be widened or narrowed at pleasure by thumb screws, which lower or raise the moveable upper board. The caoutchouc paste being plastered thickly with a long spatula of wood upon the down-sloped part of the web, which lies between the breast beam and the above described slit, the cloth is then drawn through the slit by means of cords in a horizontal direction along the lowest rails of the gallery, whereby it gets uniformly besmeared. As soon as the whole web, consisting of about 40 yards, is thus coated with the viscid varnish, it is extended horizontally upon rollers, in the upper part of the gallery, and left for a day or two to dry. A second and third coat are then applied in succession. Two such webs, or pieces, are next cemented face to face, by passing them, at the instant of their being brought into contact, through between a pair of wooden rollers, care being taken by the operator to prevent the formation of any creases, or twisting of the twofold web. The under of the two pieces being intended for the lining, should be a couple of inches broader than the upper one, to ensure the uniform covering of the latter, which is destined to form the outside of the garment. The double cloth is finally suspended in a well-ventilated stove room, till it becomes dry, and nearly free from smell. The parings cut from the broader edges of the under piece, are reserved for cementing the seams of cloaks and other articles of dress. The tape-like shreds of the double cloth are in great request among gardeners, for nailing up the twigs of wall shrubs.

Mr. Walton, of Sowerby-bridge, has recently substituted sheet India rubber for leather, in the construction of fillet cards for the cotton and tow manufactures. The superior elasticity of this article is said to prove advantageous in several respects.

13, Charlotte-street, Bedford-square,
20th March, 1839.

SCIENTIFIC NOTICES.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from p. 376.)

Jan. 8, 1839.

The President in the chair.

At the close of the last session, a discussion took place on the use of peat in the manufacture of iron; and it was stated that the late Mr. Wilkinson, of Gateshead, smelted iron with peat fuel, and that the tools made from that iron were of a superior quality; that this iron was more malleable than Swedish iron.

Mr. Mushet was not aware that the smelting of iron with peat fuel had been recently performed. He could not conceive that the mere working of iron from bar into horse-shoes could produce any sensible effect; were the whole process conducted by peat fuel, the quality might be affected. He did not believe that peat could be used in the puddling furnace; it might, however, in the refining. It might be used in the smelting furnace, but with a diminished produce. For welding a hollow fire is necessary, and peat will not readily make a hollow fire; iron may be improved in point of hardness, by the use of peat. He had analysed many kinds of peat, and never found one to contain less than 5 per cent. of earthy matter; many contain 20 per cent.: coal seldom contains more than 4 per cent. The common bog peat contains 25 per cent. of carbonate of iron.

Several present bore testimony to the improvement in the working of iron by the use of peat, and that better weldings were made by it in consequence of its freedom from sulphur. The absence of sulphur in peat was denied by Mr. Lowe, who had used it for making gas at Amiens, and the quantity of sulphuretted hydrogen produced in the purifiers was very great. The Newcastle coal varied much in its qualities; some is exceedingly bituminous, making abundance of gas, but abounding also in sulphur and pyrites. He never met with any coal which did not produce sulphuretted hydrogen, thus proving sulphur to be an element of coal. The Tanfield coal is peculiarly free from sulphur. Dr. Smith remarked on the great influence which the strata had on the quality and nature of the peat; that the Dartmoor peat differs from all other peat in that it burns with a red ash.

It was remarked that the smiths in Cornwall owe much to their long practice in the use of peat, just as the smiths of Pembrokeshire have learned to use anthracite. Both, however, would probably use pit coal, could it be easily procured.

The conversion of iron into steel was discussed; and it was stated that iron could be converted into steel by immersion in pure carbon, as in the Macintosh process, at the rate of 1-30th of an inch per hour. Mr. Roberts stated the success of case-hardening depended on the gentleness of the heat. Great care must be taken not to overheat, and case-hardening might take place to the depth of 3-8ths of an inch in four or five hours. It was stated to be cyanogen united with iron which produces case-hardening, but carbon which produces steel. An instance was mentioned by Mr. Carpmael in which animal charcoal was used for case-hardening the interior, and vegetable charcoal for softening the exterior. Allusion was made to the fact, that the most perfect chill is obtained by the employment of moulds red hot.

Mr. Farey alluded to the charcoal, or peat coke, which Mr. Oldham employs at the Bank of England; this is in thin cakes, and denser than the heaviest wood. Mr. Bramah remarked on the great value of compressed peat, could it be procured at a marketable price, on account of its superiority as a fuel for making large weldings.

The preceding minutes having been read, Mr. Parkes stated that the greater part of the charcoal used in Paris is from peat. The peat charcoal is preferred to the very best wood charcoal. There are two modes of making this charcoal. In a Swedish furnace, which is an oven made of lumps of peat, the pieces to be carbonised are placed in the interior, ignited, and smothered up in the usual manner. The other mode consists in getting peat as dense as coal, by allowing the small atoms to come within the natural force of cohesion. The peat for this purpose is dredged up from the bottom of streams, and laid up to dry, and formed into small bricks, which, on drying, contract very much. Compression will not do. In Holland they dig the turf and put it into running water. The water cannot be driven out by pressure. He had seen peat compressed with a force equal to that for pressing bowls for calenderers, but it was not near so dense as that formed by the natural means just alluded to.

Mr. Pellatt remarked, that the coking coal does not deprive it of the sulphur. Washing the coke will remove much that remains; but even then it cannot be used for welding glass—

nothing but the purest beech-wood will serve for this. Charcoal will not answer, as it requires a flame. By welding, he meant the operation of putting a handle on a vessel. The glass being of a proper temperature, a union formed, provided no sulphur be present.

Mr. Lowe remarked, it had been practically found that beech-charcoal is valuable because of the quantity of carbon it contains. There is more pure carbon in a given weight of beech-wood than of any other kind. Oak is the next best.

Jan. 29, 1839.

Bryan Donkin, V.P., in the chair.

"On Framing Lock Gates without Iron Work." By S. Ballard, A. Inst. C.E.

The ledges, or horizontal pieces, are held to the back and mitre-post by dovetail tenons and wedges, thus avoiding the use of iron T pieces and screw pins, which occasion the wood in immediate contact with them to decay, while the parts not pierced with iron are perfectly sound. This method was adopted in some gates on the Herefordshire and Gloucestershire canal, and, after some years' experience, is found completely successful. Tar and white lead are put into the mortices, and the wedge driven down upon it, so that every crevice is filled, and the joints rendered water tight; the planks also are fastened on with oak pins instead of nails.

Some discussion took place on the general opinion, that when dissimilar substances are in contact, as when a gate of one kind of wood is fastened with pins of another wood, some action tending to loosen the pins prematurely takes place betwixt them.

"On Tubing the Boilers of Locomotive Engines." By George Buck, M. Inst. C. E.

In this communication the author has attempted to determine the diameter of the tubes of the boiler of a locomotive engine, so that the effect in the generation of steam may be a maximum. The following are the conditions upon which the problem is solved:—That the evaporating effect of the hot air, in passing through the tubes, is in proportion to the extent of surface in contact with the hot air, and as the time of contact conjointly. The following are the results of the investigation:—The distance between the centres of two adjacent tubes should be equal to four times the interval between their internal surfaces; the diameter of each tube should be equal to three times the same interval; that the tubes should be as near each other as possible.

In illustration, Mr. Buck has drawn two sets of tubes of the locomotive boiler as generally employed, and one as they would be arranged according to the results of this investigation. On comparing the products of the aggregate periphery, and the aggregate area of the tubes, it appears that the boiler tubed according to the above theoretic proportion is from 23 to 26 per cent. superior to the others.

"On the State of the Suspension Bridge at Montrose, after the Hurricane of the 11th of October, 1838; with Remarks on the Construction of that and other Suspension Bridges, in reference to the Action of violent Gales." By C. W. Pasley, Col. R. Engineers, Hon. M. Inst. C. E.

By the hurricane of the 11th of October, 1838, one-third part of the roadway of the bridge at Montrose, with a very small exception, was carried away. The suspension rods on the west side were either broken or very much bent, but the chains, four in number, and extending in two parallel lines of two tiers each, appeared perfect. The distance between the piers is about 410 feet; and the chains had been strengthened by additional bars, or plates, since the bridge was erected. The statements of Mr. Provis, and the author's own observations, led him to the opinion that the motions which a bridge experiences are not lateral, but longitudinal. The Hammersmith suspension bridge does not appear to be subject to those longitudinal motions even in a most violent gale; and Col. Pasley considers this is amply accounted for by the longitudinal trussing which is there adopted. The idea that these longitudinal motions, and the injuries to the roadways of suspension bridges, are owing to the violent action of the wind from below, is confirmed by what Col. Pasley witnessed in November, 1836, at the Chatham dock-yard. One side of the roof of a shed for ship-building was raised up and down repeatedly, till at last a large portion of it, about 40 by 50 feet, was floated up like a sheet of paper, and carried to a distance of 50 yards. Such being the violence of the wind, we may readily conceive that the continual extension and compression to which the suspending rods must be subject by the rise and fall of the roadway, will, in time, break or bend them. This rise and fall of the roadway is prevented in the Hammersmith bridge by four lines of strong trussing along the whole length of the roadway, firmly connected to the bearers below; no similar trussing exists in the Menai, the Montrose, or any other suspension bridges which Col. Pasley has seen, or in the Brighton pier. The damage done to the latter, in November, 1836, is attributed, by Lieut.-Col. Reid, who witnessed it, to the action of the wind on the under surface of the roadway, and not to the lightning. The rise and fall of the platform of the Menai bridge is confidently stated to be three feet in ordinary gales, so that, unless some similar trussing be employed, it may reasonably be expected that this bridge will be seriously injured in some hurricane. The peculiar construction of the suspension rods in several pieces, with joints, is a source of security to this bridge which the others do not possess. The author conceives that no suspension bridge of 400 feet betwixt the piers can be considered secure without two, at least, inflexible lines of longitudinal trussing from pier to pier.

Feb. 5, 1839.

The President in the chair.

At the preceding meeting, Mr. Cottam had mentioned an instance of iron enclosed in lead for 90 years being taken out with the fin and bloom unimpaired.

Dr. Faraday inquired whether this was in London, as the quantity of sulphurous acid in our atmosphere, from the coal we burn, occasioned corrosions which do not occur in other countries. This was especially remarked by foreigners. Some years ago considerable discussion took place on the more rapid decay of the stone in the front of Somerset-house, than of the same stone in other situations; it had not occurred to him to refer it to the acid in the atmosphere.

Mr. Sibley remarked, that Westmoreland slating, which is extremely durable in other places, will not last in London.

Mr. Cooper had often observed the large quantity of sal-ammoniac and muriate of ammonia always to be found in the atmosphere of London. This arose from the soot, the rain washing it out, as might be at once ascertained by collecting some water, during a shower of rain, on a clean glass—muriate of ammonia was always in excess.

Mr. Lowe inquired whether any one had observed in the spouts conveying water from the tops of houses a pellicle as of a volatile oil, or oxidable matter, on the first water from the tops of all houses, after a dry season. This peculiar pellicle is irradiscent, and disappears after a few hours.

Mr. Williams laid before the Institution a series of specimens of turf, from the first state as taken from the bog, to the last when compressed, and after it was converted into a hard coke. He also described the new resin fuel, or artificial coal, and which was composed of resin and turf coke.

This resin fuel has been used in the Transatlantic steam-vessel; and, besides its heating powers and the saving of weight, it enables the fireman to maintain the required pressure of steam with great regularity.

The mode of using it was described to be to throw it in front of the furnace, after the charge of fresh coal. The result was, the keeping up the steam until the coals burned up, and a better combustion of the coal took place. As the result of several trials, it was found that 2½ cwt. of this fuel was equal to 7 cwt. of Lancashire coal. It was not used alone, but associated with the coal. The vessels to New York took out from 40 to 60 tons each of it. Thus 2½ cwt. of the resin fuel and 20 cwt. of coal, was equivalent to 27 cwt. of coal. In practice, the steam-vessels now carry and use a large quantity of resin, but which could only be used in connexion with small coal or cinders. This new fuel was, therefore, more economical than resin. The price was 35s. to 40s. per ton.

Mr. Lowe remarked, that the statement of Mr. Williams respecting the peat fuel, led practically to inferences contrary to the results stated in Mr. Parkes's paper, and to Mr. Apsley Pellatt, and to his own experiments; viz., that 9lbs of coke would do as much in any department of the arts as 12lbs. of coal.

Results so diametrically opposite, and from persons working on the large scale, and of known accuracy, were not to be disputed. It seemed that we had either yet to learn some unknown laws of combustion, or that the experimenter had not been alive to the differences resulting when combustion was conducted under the widely different circumstances which each experimenter might have in view. Mr. Parkes's test was the evaporation of a known weight of water by a known weight of fuel, coke or coal, employed. Mr. Pellatt's test was the circumstances most beneficial to the temperature of a glass-house furnace. Now these results, wonderful to relate, were strictly in accordance with the results of the experiments of Marcus Bull, of Philadelphia, whose test was the raising the temperature of a chest of known cubical contents (512 feet), by 10 degrees of Fahrenheit. All these experimenters find that, so far from coal and coke having the same value, it requires 4lbs. of the former to produce the same effect as 3lbs. of the latter. Now, it does appear that the results of Mr. Williams are conflicting with these. He finds that equal work is produced in the marine engine by substituting one ton of a mixture of peat and resin for four tons of coal; which coal, in its composition, weight for weight, must contain a far less quantity of hydrogen and oxygen than is known to exist in the generality of peats. It appears that one ton of peat and of a hydro-carbon, far more inflammable than coal, supersedes all the carbon, hydrogen, oxygen, and a little nitrogen, combined in four tons of coal. I would suggest, as a theory for investigation, whether it may not be found that the coal or other fuel, which contains chemically combined the least oxygen, will not in its combustion give off the most available heat, owing to the oxygen combining with the hydrogen producing less water, which, as aqueous vapour, will carry up the chimney a large portion of the heat, but in a latent state.

Mr. Cooper remarked, that Marcus Bull's experiments were hardly applicable to the present inquiry, as he had constructed a box by which to ascertain how much air was heated by a given quantity of fuel, looking more to the domestic economy of the fuel than to its uses in the arts.

Dr. Faraday was of opinion, that a close comparison ought not to be instituted betwixt the application of heat to glass pots and to a boiler. In the former case, an immense quantity of heated air passed away as in the smelting furnace for iron, where a greater weight of air passed through the furnace than all the other materials, as coal, limestone, and ironstone; in the latter case, there is an immense demand for latent heat. We know that a very small quantity of fuel is sufficient to heat and keep hot a large mass of matter where there is no rapid absorption of latent heat.

The experiments just referred to show little as to the absolute quantity of heat in different fuels, as there was so great a difference in the quantity worked out in the two cases. To imagine that the coke of a chaldron of coals should produce as much heat as the chaldron of coals, could not be the case, or the heat of the coke oven would go for nothing. But there is so great a difference in using coke and coal for heating glass pots and under a boiler, that the two cases cannot be compared. He should conceive that very great advantages might result from having a resin fuel in the front of the fire; the resin would, perhaps, not be advantageous by itself, but more advantageous with an inferior than with a superior coal.

Several instances were mentioned in which it had been attempted to render the heat of coke ovens available for other purposes; the results were very contradictory. Many patents had been taken out for this purpose, but they failed. In one case, a coke oven heated the boiler of a steam engine, but the steam generated was barely sufficient to move the engine when doing no work. It was found also, in some experiments, that a proper coal for coking being used, there was no available heat for the generation of steam; an improper coal being used, there was steam, but little coke.

Mr. Lowe remarked, that the analysis of coal was very imperfect. One author tells us that cannel coal contains no oxygen; but the gas-maker knows that this coal, though previously perfectly dried by being brought to a boiling heat, yields three times as much water, called ammoniacal liquor, as any other coal. This results from the combination of the elementary oxygen and hydrogen producing water, which, as vapour, is extremely greedy of heat. It was an important inquiry, whether the quantity of elementary oxygen in coal may not occasion the difference between it and coke.

Mr. Williams stated, that peat employed in connexion with coal makes a most improved coke. If one-fourth of Lancashire peat be added to three-fourths of coal, a coke which the ironmasters pronounce to be the best for the manufacture of iron is produced, whereas coke from the coal simply cannot be used for this purpose.

Extracts from Smeaton's MS. Papers, communicated by John Farey, M. Inst. C. E.

Mr. Smeaton, in a letter dated 25th November, 1778, remarks, that he had seen, at Furness Fells, in Lancashire, a blast furnace for smelting iron with peat. This peat iron, made by Mr. Wilkinson, possessed extremely small grain, and the metallic atoms being very closely combined, and was found to answer well when mixed with other iron for making slit mill rollers.

Mr. Farey also communicated some extracts from the papers of Mr. Mushet respecting the manufacture of iron with peat; the quality of the fuel, and the nature of the iron produced therefrom.

List of Patents

Granted by the French Government from the 1*st of January to the* 31*st of March*, 1838.

(Continued from p. 379.)

To Noel Jarry and Benjamin Philippe, of Paris, for an apparatus called *viamobile*, calculated to be used instead of fixed railroads.

— David Barillot de Malpierre, of Paris, for an apparatus for extracting and burning limestone.

— William Robert Smart, of Sussex, for improvements in the engraving of cylinders used for printing papers and tissues, &c.

— Jean Claude Janin, of St. Foy les Lyon, for a frame to weave and cut at the same time two pieces of plain velvet.

— Charles Esbrard, Toussaint Battiste, Pierre Morati, and Pierre Giraud, of Paris, for a new manner of cleaning the bark of mulberry, of lime, or other barks fit for the manufacturing of paper, or India paper.

— John Isaac Hawkins, of London, for a new power engine, applicable to locomotive or other purposes.

— Mathieu François Isoard, of Paris, for improvements in acoustics.

— Count Louis Jelski, for a common recipient for retaining gaseous fluids.

To the Iron Company of Andincourt, for a new means of procuring caloric, so as to dispense with blast furnaces, &c.

— Claude Arnoux, for a new system of locomotion on railroads.

— Claude Brice Huillier, of Monthérie, for a method of obtaining all the carbon contained in wood.

— François Charles Sinot, of Paris, for a new kind of a balance lever, called *Sinot* lever.

— Auguste Boucherie, of Bordeaux, for a means of penetrating wood with matters fit to preserve, scent, and colour it.

— François Charles Busset and François Bertrand Lœulliet, for a new method of printing music.

— Jean Louis Théodore Gudin, of Paris, for a new mode of impression.

— Néron, jun., of Rouen, for certain improvements in the printing of silk, cotton, or linen fabrics.

— Michel Beaudelot, of Harancourt, for an apparatus for collecting the gases which escape from the mouth of blast furnaces, and bringing them back into the said furnaces.

— Pierre Auguste Delacroix and Jacques Hubert Detrimont, of Paris, for an improved mode of making bread.

— Jules Marechal and Co., of Paris, for an improved method of placing filtering matters.

— Philippe Mathieu, of Paris, for a new gas-meter with a rotary piston.

— Miles Berry, civil engineer, of London, represented by Mr. Perpigna, for additions to his former patent for preparing a certain colouring matter applicable to dyeing, to the printing of fabrics and to writing.

— Michael Emmanuel Valadon, of Paris, represented by Mr. Perpigna, for additions to his former patent, for improvements in the means of stopping bottles and other vessels.

PATENTS FOR TEN YEARS.

To Raphael de Ayala, represented in Paris by Mr. Perpigna, advocate, of the French and Foreign Office for Patents, rue Choiseul, for improvements in parasols and umbrellas.

To Pierre Louis Machu and Henry Black, of Lille, represented in Paris by Mr. Perpigna, for a new embroidery, called *grain de riz*, applicable to bobbin net.

— Joseph Samuda and Joseph d'Aguilar Samuda, engineers, of London, represented in Paris by Mr. Perpigna, for improvements in gas-meter.

— Auguste Petibon, of Madrid, represented in Paris by Mr. Perpigna; for oil of kalbary, to die hair.

— John Davies, of Manchester, represented in Paris by Mr. Perpigna, for improvements in printing calicoes and other fabrics.

— James Henry Nelson, of Warwick, represented in Paris by Mr. Perpigna, for an improved method of purifying isinglass.

— Simon Suzanne hérée Boubéc, represented in Paris by Mr. Perpigna, for an improved portable apparatus for teaching geology.

— Louis Vincent Raymond Baudoin, represented in Paris by Mr. Perpigna, for a machine to cut wood, and called *planing machine.*

— John Chanter, of London, represented in Paris by Mr. Perpigna, for additions to his former patent for improvements in steam generators.

— Auguste Martin Théodore Loth, represented in Paris by Mr. Perpigna, for additions to his former patent for improvements in umbrellas.

— Pierre Orphée Erard, of Paris, for a double-action harp.

— Nicholas Mathieu Rienssec, of Paris, for improvements in chronological tables.

— Henry Menet, of Paris, for improvements in the fabrication of paper.

— Baudoin, brothers, of Paris, for a new kind of gaiter.

— Julien Dumont, of Paris, for a new method of clarifying sugar and syrup.

VOL.

Tenneson's Gas Apparatus

Fig. 4

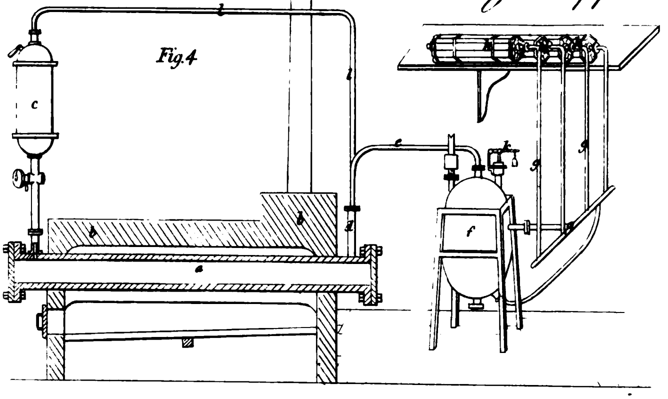


Fig. 2

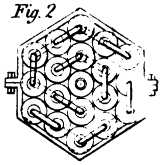
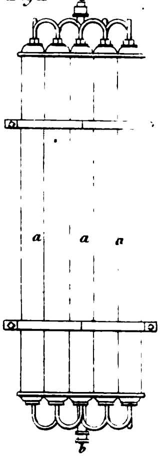


Fig. 1



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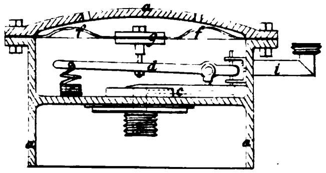

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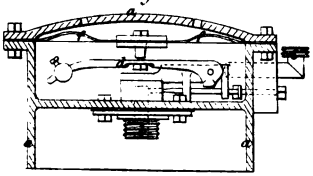
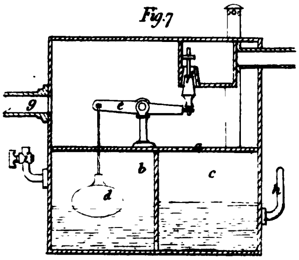


Fig. 7



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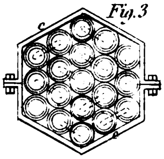


Napier's Printing Machinery

Fig. 11

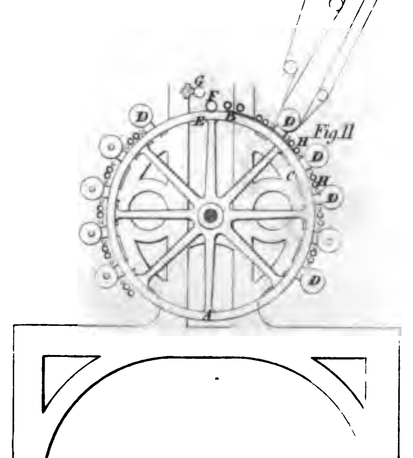
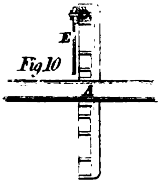


Fig. 10



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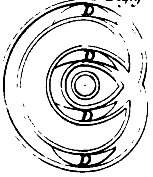
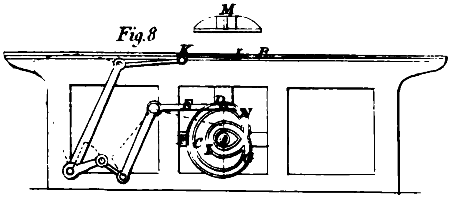


Fig. 8



W. Newton Del.

1839.

Newton Sc.

Foucard's Gun Lock

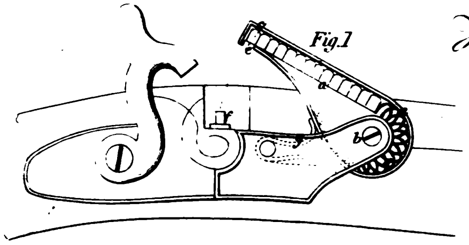


Fig.1

Harrold's Paper making Appts

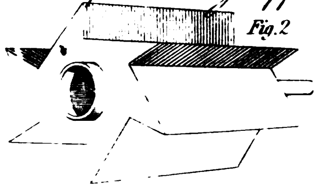


Fig.2

Axon's Spinning Machine

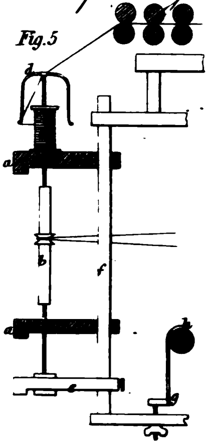


Fig.5

Perkins's Blowing Apparatus

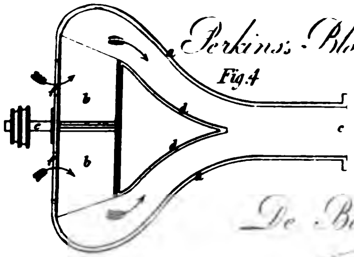
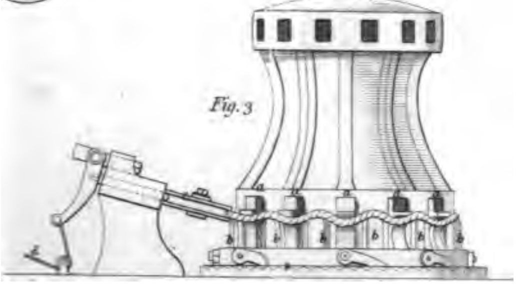


Fig.4

De Bodes Capstan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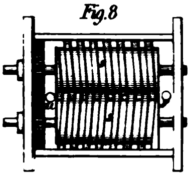
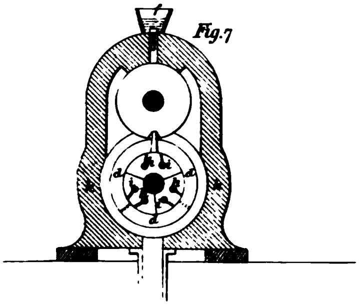


Fig.8

White's Machine for raising Water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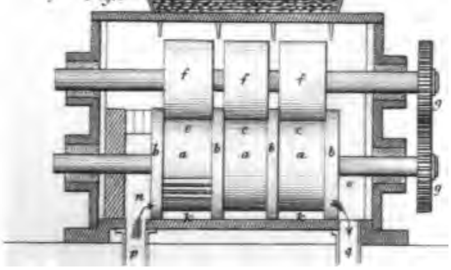
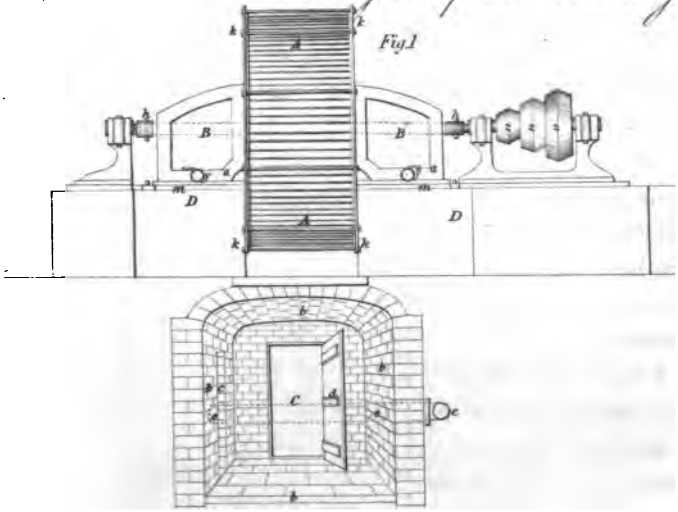


Fig.6

Fourness: Impt. in Ventilating

Fig. 1



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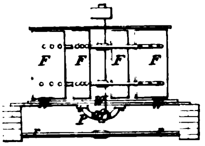

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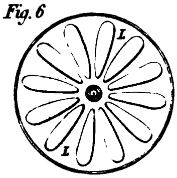

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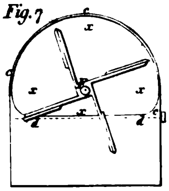

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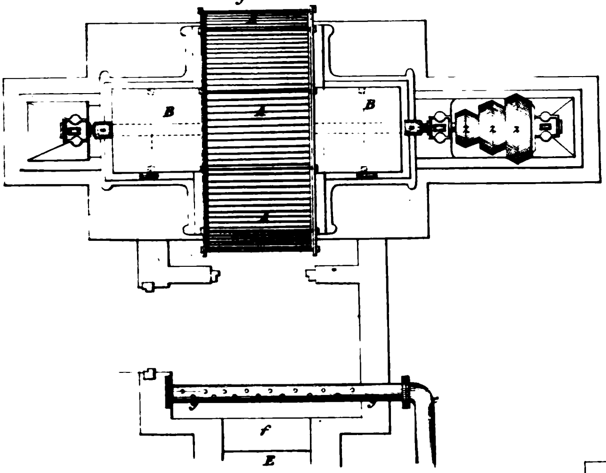

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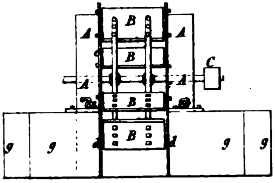

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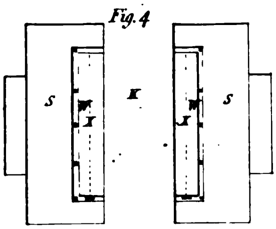
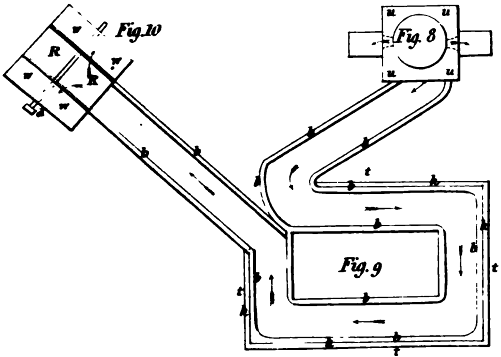
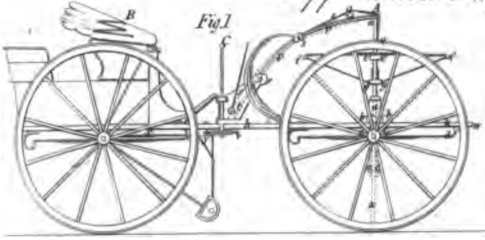




Peppercorne's Impd Carri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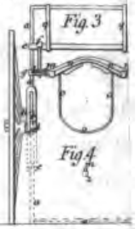


Fig. 3
Fig. 4

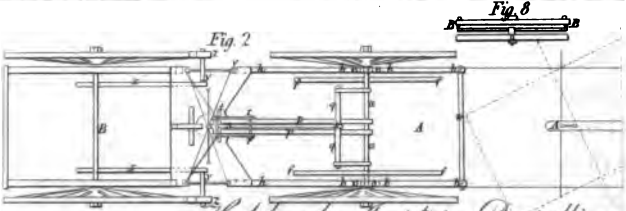
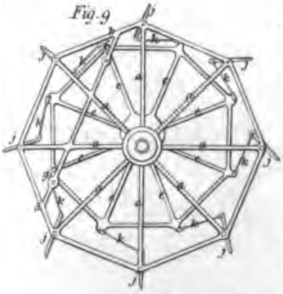


Fig. 8
Fig. 2

Holebrook's Impts in Propelling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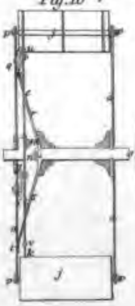
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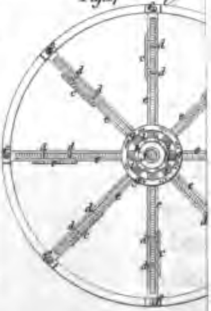
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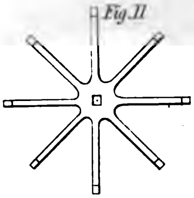
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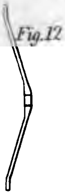
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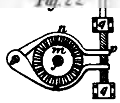
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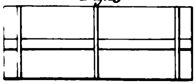


Fig. 13

Fig. 14

Fig. 16

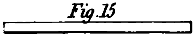
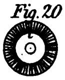


Fig. 15

Fig. 19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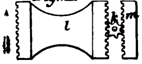
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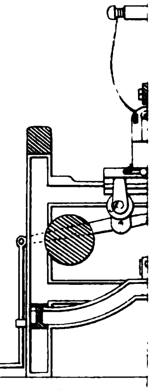


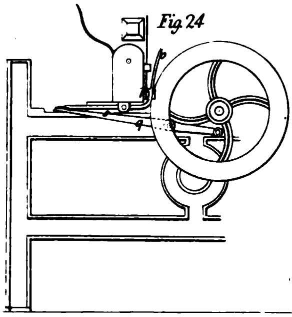
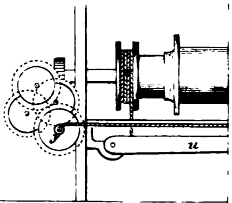
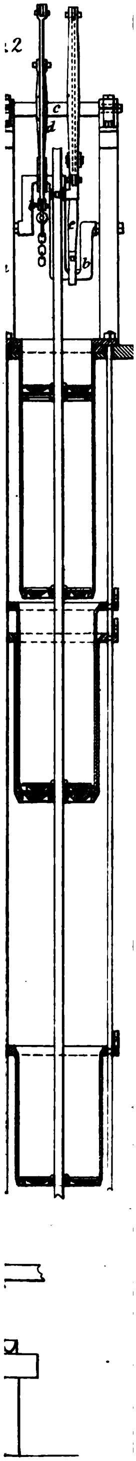


Fig. 24

Fitton &

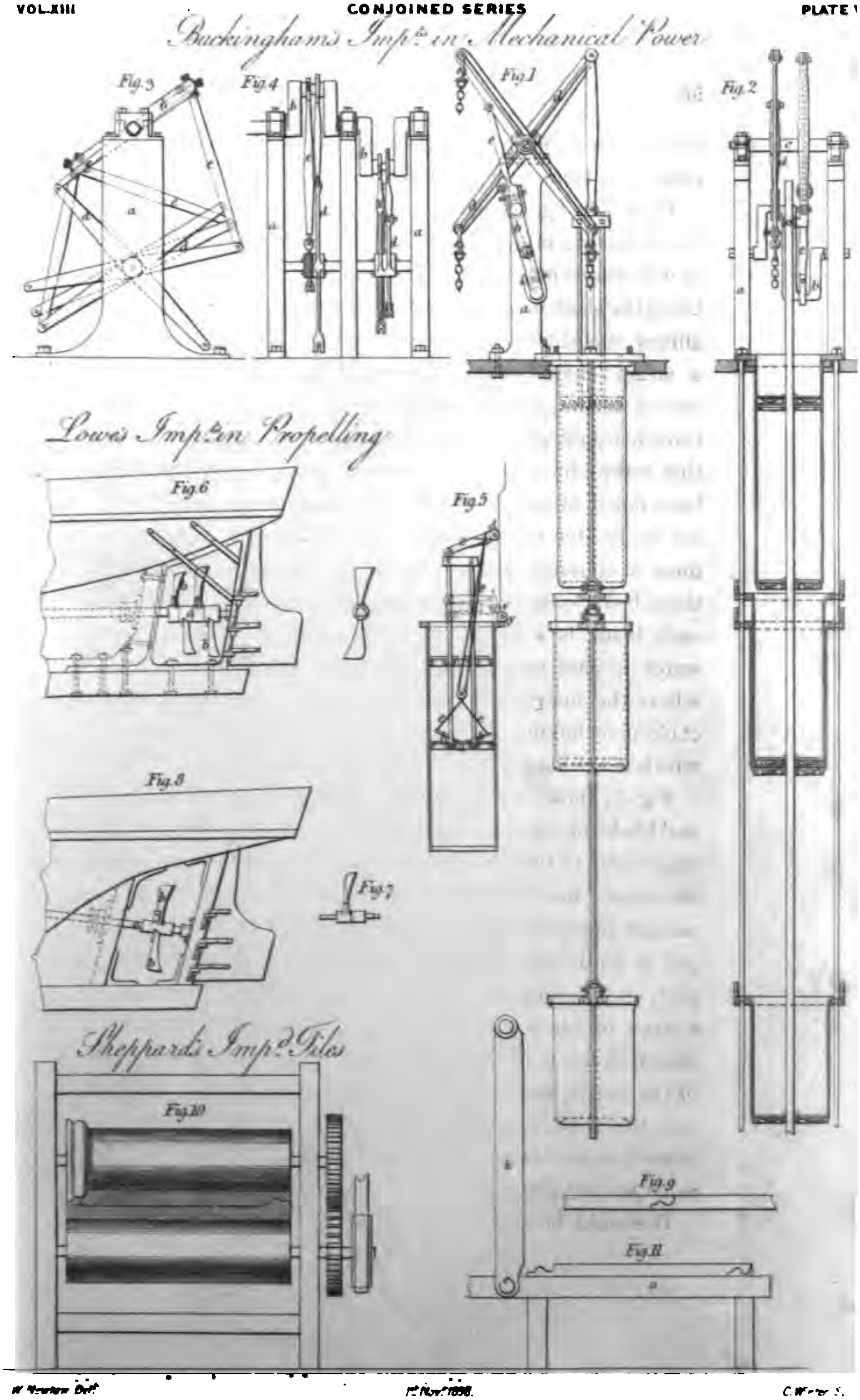




W. Newton Delt

1 Novr 1838.

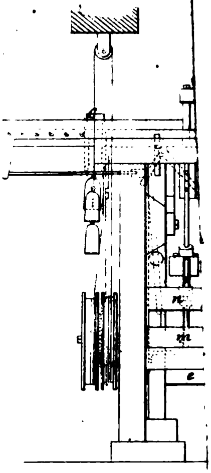
C. Winter Sc.

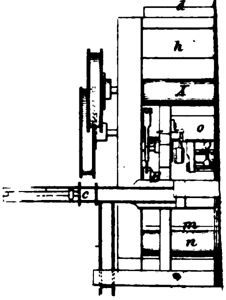


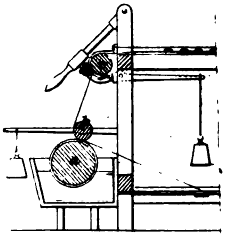
W Newton Delt 1st Novr 1838. C.W[illegible] S.

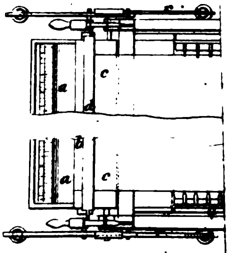
VOL.XIII

PLATE VIII









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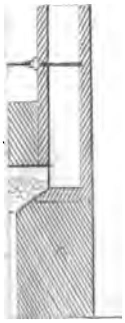
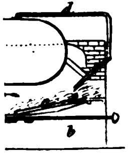
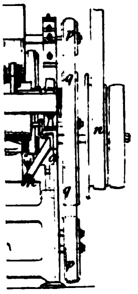


Consumer





F. Yates sc.

Joyce's Stoves

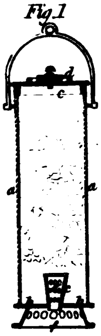
Fig. 1


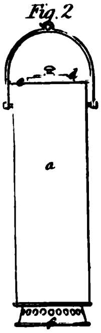
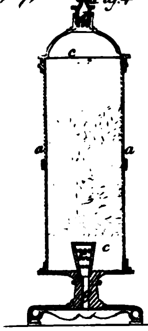
Fig. 2


Fig. 4


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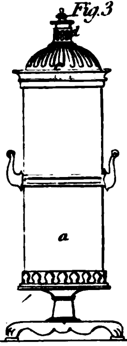

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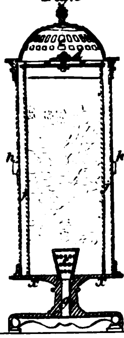

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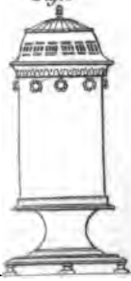

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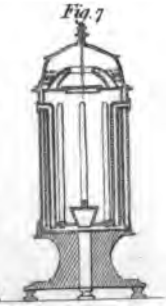
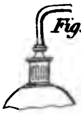


Fig. 10


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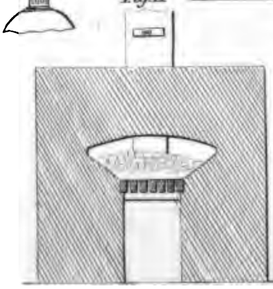

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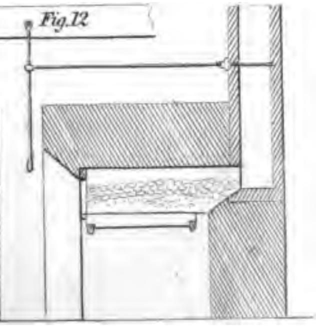

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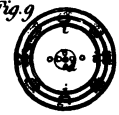

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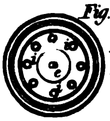
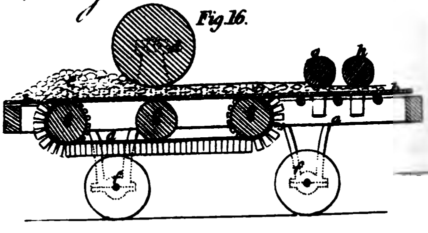
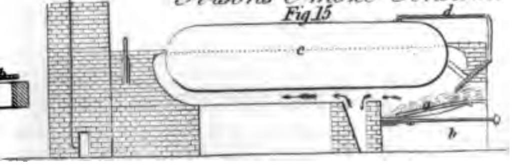


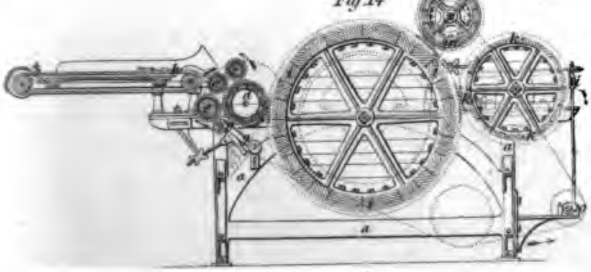
Pleney's Brick Machine

Fig. 16.


Ivison's Smoke Consumer

Fig. 15


Bates' Wool Dressing Machine

Fig. 14


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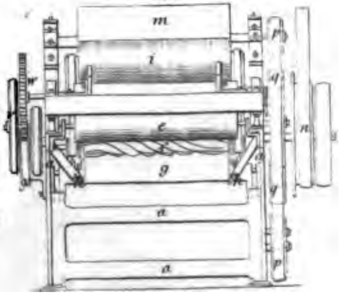

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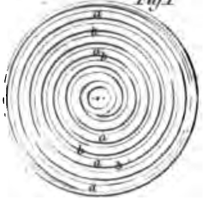

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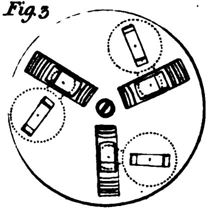

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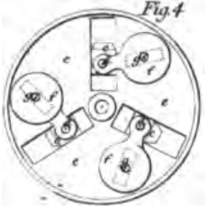

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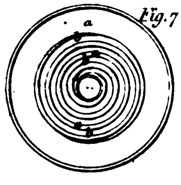
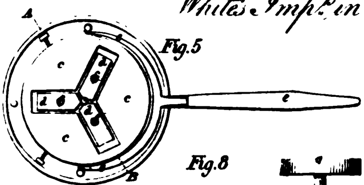


White's Impt. in Lathes

Fig. 5



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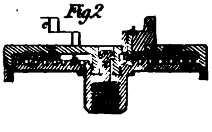

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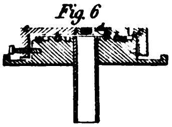

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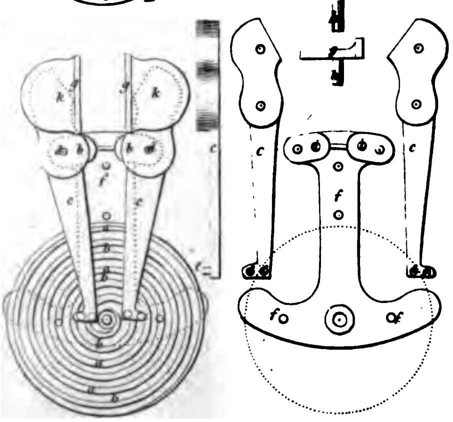

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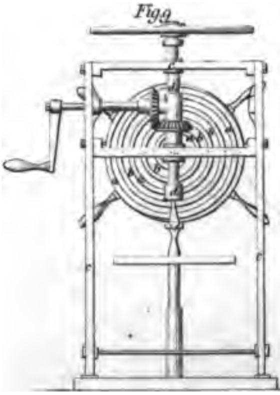

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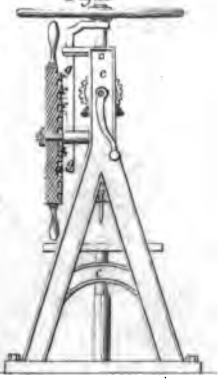
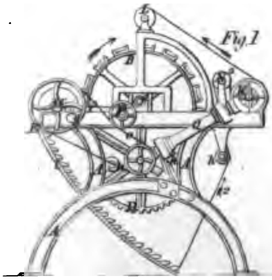


Lewis & Ferrabee's Impt. in Dressing Cloth

Fig. 1



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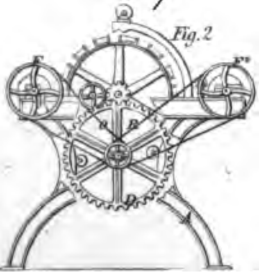

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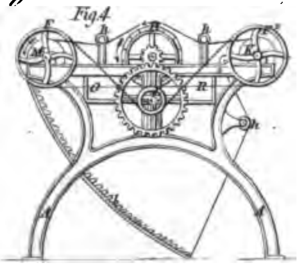


Pearce's Wheel

Fig. 3

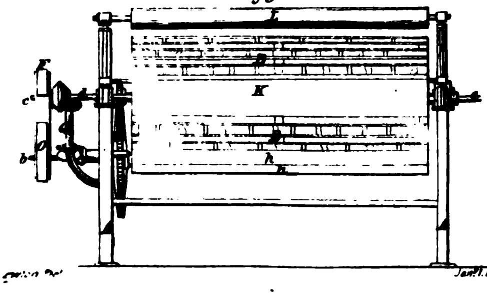
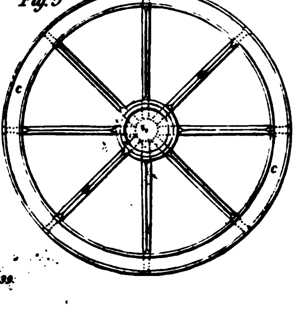


Fig. 5



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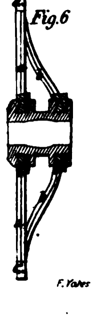

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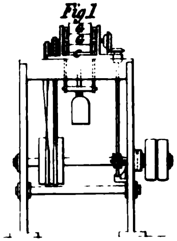
F. Yates Sculp.

Nicholson's Spinning Machinery

Fig. 1



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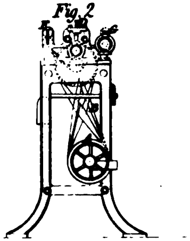

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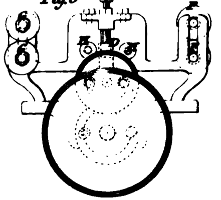

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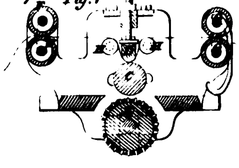

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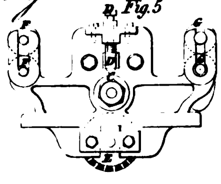

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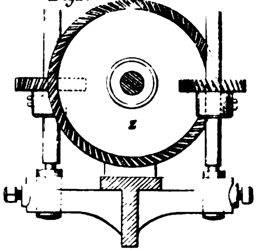

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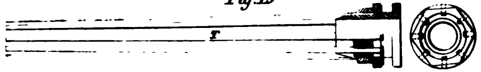

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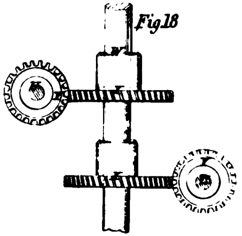

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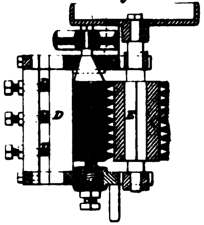

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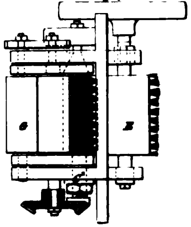

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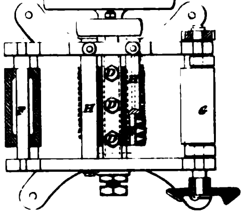

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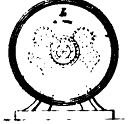

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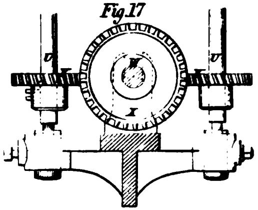

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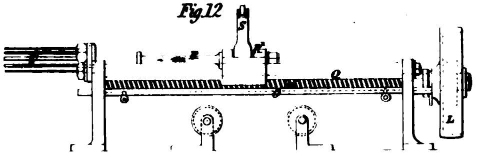

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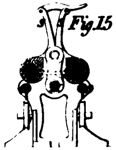

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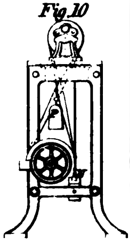

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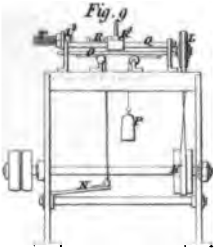

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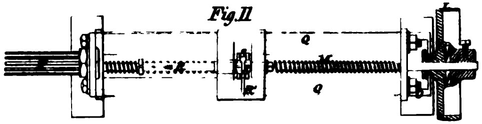

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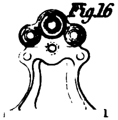

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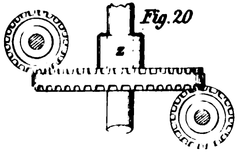

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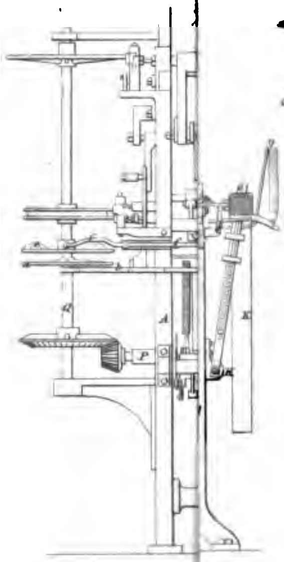

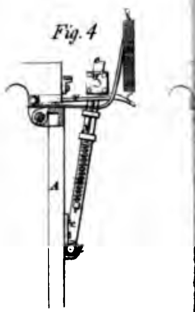

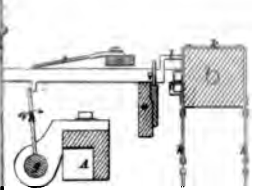

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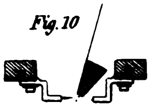
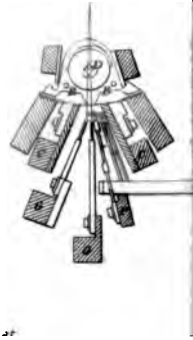
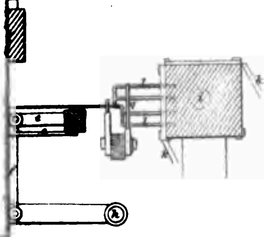
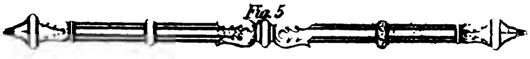
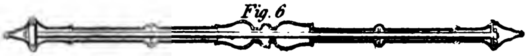






Dales Bed Posts





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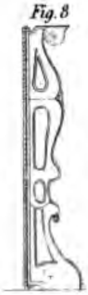

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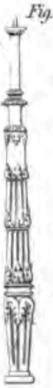

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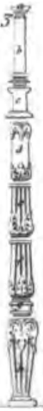

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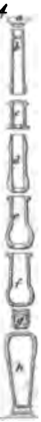

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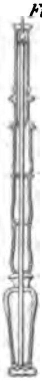

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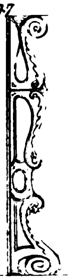
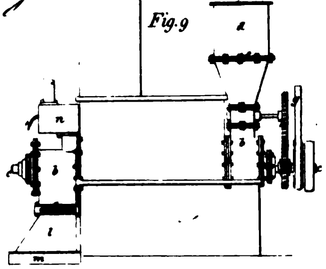


Heginbothams Retort

Fig. 9



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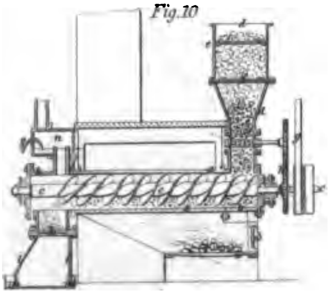

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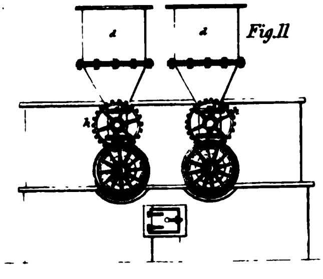
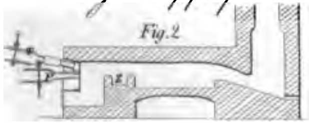


Berry's Appts. for Economizing Heat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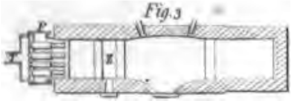
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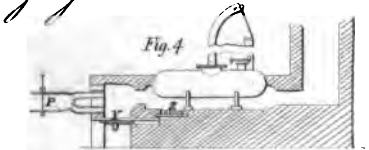
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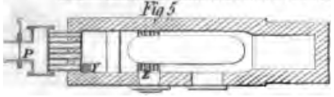
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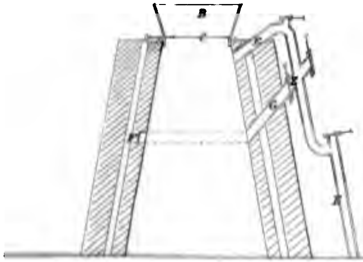

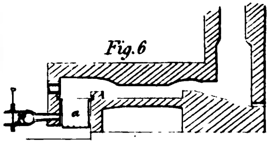
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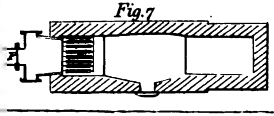
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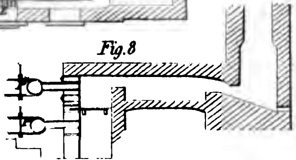
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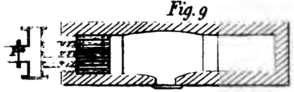
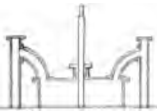


Fig. 9



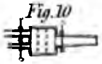


Fig. 10

Westhead's Appts. for cutting India Rubber

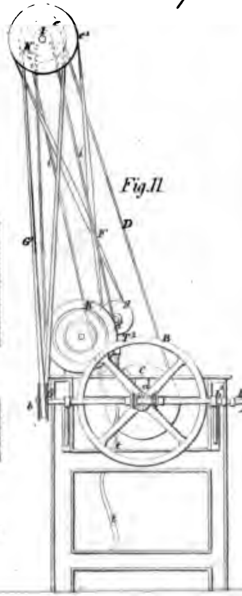


Fig. 11

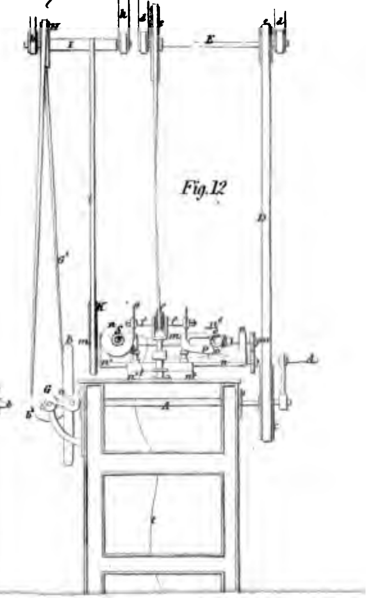


Fig. 12

VOL. XIII

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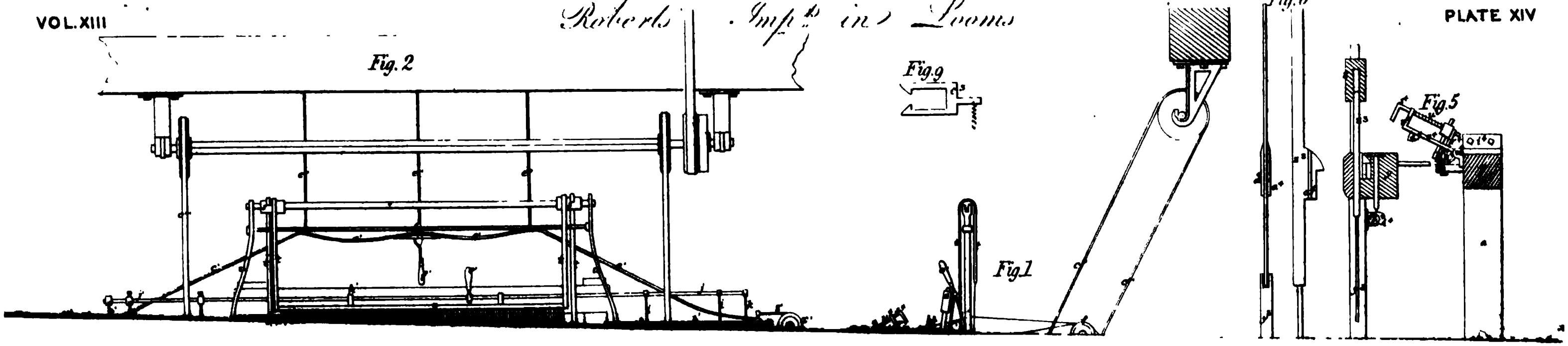
PLATE XIV

Roberts · Impts in Looms



Southam's Impts in drying Grain.

Fig.1

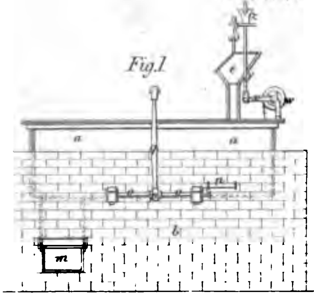


Fig.2

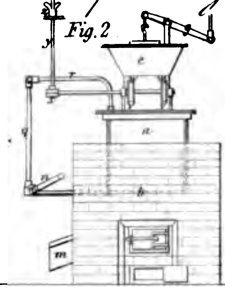


Fig.4

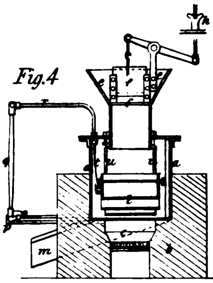
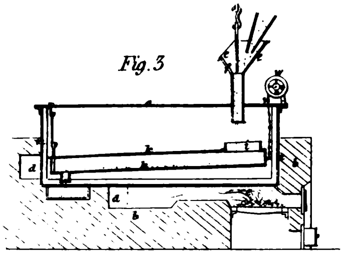
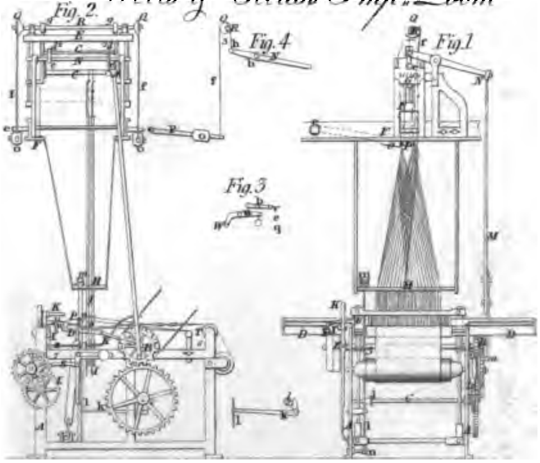


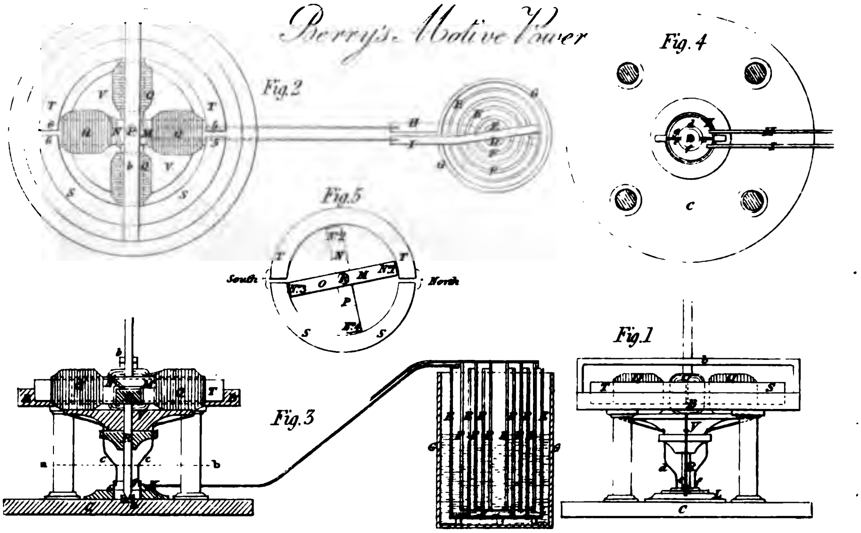
Fig.3



Wells & Eccles's Impd Loom



Perry's Motive Power



W. Newton Delt. March 1st 1839. A. V. Newton Sculpt.